In This Issue—*Shall We Divide Service?*

MOTOR AGE

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Number 12

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CHICAGO, MARCH 18, 1920

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Three Dollars a Year

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It seeps between the springs, thoroughly lubricating them. Makes your car ride easier, reduces the liability of spring breakage.

MOTOR AGE

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E. E. HAIGHT, Manager
DAVID BEECROFT, Directing Editor B. M. IKERT, Editor

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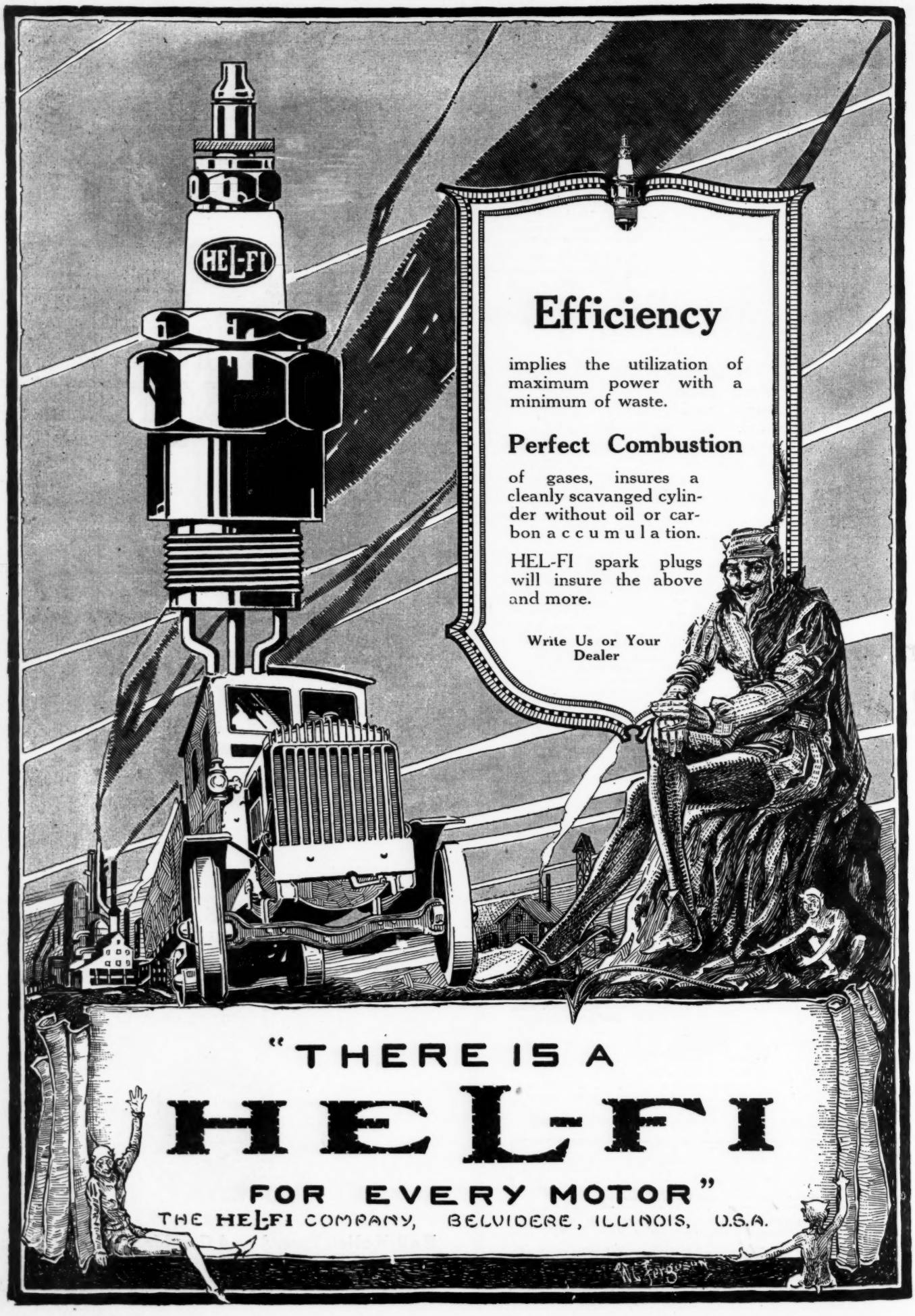
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The Publisher's Service Station

Rendering Service to Help You Render Service

4 Special Messages This Week

No. 1: Segregating Service Work. The lead story in this number of MOTOR AGE is the result of various opinions expressed by many dealers who operate service departments and who have given much thought to the subject of dividing service work. Needless to say, there is going to be a bigger demand upon car dealers to handle both the sales and servicing of trucks and tractors. Some dealers insist that a single department should handle all service work, while others contend that it is much better to keep truck and tractor service work separate from that of passenger cars. There's a reason for everything and MOTOR AGE wants you dealers who are interested in this subject to join in the discussion, so let's have your opinion.

No. 2: Better Methods for Ordering Repair Parts. Anything that will help simplify the filling or handling of repair parts is bound to eliminate a great deal of time and worry. Most of us will admit that good results are assured if our methods dovetail with those of the factory. There is an article in this issue telling how one factory has worked out a plan with its distributors and dealers whereby but three symbols—just two numbers and one letter—complete the key for placing and filling an order. The numbers tell the group, the part they belong to, while the letter is the serial guide to the drawing on file in the factory's drafting room. This code simplifies matters and since this will be a busy year for the "parts department" it would help all around if we could sort of standardize our methods and thus avoid worry and delays caused by poor systems, some of which are still employed. A study of the methods described in this article may give you some new ideas that will help you out of a bad predicament later.

No. 3: Lapping Main and Connecting Bearings. Who said it was possible to lap in main and connecting rod bearings? Bet you mechanics said it couldn't be done like we lap in pistons and rings in cylinders. That used to be the case, but alas! someone has come along and showed us how it can be done now and—best of all—in about a quarter the time it took previously. Interested? Sure you are, but we'll let the article tell you all about this new method.

No. 4: Bonus System for Mechanics. After much careful thought and consideration, one of our friends in Iowa decided to put his men on a bonus basis and he's getting by in great shape. It seems that the first thing his company did was to employ a clerk to keep an accurate check on time consumed on various jobs. Now they can estimate accurately every job and pay their mechanics a stipulated amount that works to the satisfaction of both employe and employer. If you want to learn how one concern has worked out a system that satisfies, read this article.

APRIL FIRST

Many jokes are played on this date but MOTOR AGE is taking it very seriously. Its number bearing that date is going to contain a real fund of serious matter that will bring home the bacon for you. Watch for its "Summer Service Number"!

Stewart MOTOR TRUCKS

Here's the proof:

Fleets that grew from one

It isn't the **size** of a truck fleet that tells the real story. A big industry that decides to motorize may buy 20 to 50 trucks at once—may make a mistake of judgment that will never be discovered. But the business man who buys one truck, finds it pays big, has to buy another and still others to keep up with expansion—his experience is a valuable guide.

Stewart dealers can tell you of numerous cases, right in your own vicinity, where the first Stewart expanded gradually into a large fleet, and every truck that was added was another Stewart.

Each Stewart fleet tells a complete story of the service, efficiency and economy of Stewart trucks—a story that has gone round the world—for Stewarts are giving everyday satisfaction in 600 American cities, on hundreds of farms and in 38 foreign countries. And only through this satisfaction of owners could the Stewart Corporation have become one of the world's leaders in truck building in only 7 years.

Read what these fleet owners say:

HENRY J. BALL
Milwaukee, Wis.

We are using at the present time twenty-six Stewart trucks from one ton to three-and-one-half ton capacity. This explains how we like them. We are more than satisfied and we expect to buy more in the near future. When we began buying trucks we had several different makes, but are so well satisfied with the Stewart trucks that we are now standardizing on them.

(Signed) HENRY J. BALL.

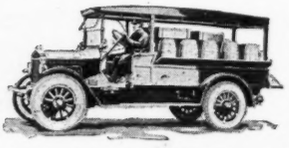
ROTHENBERG & CO.
W. 14th St., New York City.

We have thirteen Stewart trucks and operate them an average of 40 to 50 miles every day. Three of these trucks in a year's time have not cost us more than $100 for repairs. Upon this splendid performance, we decided to buy ten more Stewarts, and find we have made no mistake. The trucks give us perfect satisfaction, and with the service you render us nothing more can be asked.

(Signed) LEO A. PRICE, Pres.

(Have bought more since writing above.)

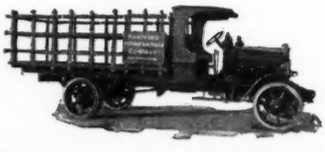
Model 11—¾-Ton Capacity Chassis—$1350 Electric starter, electric lights, magneto ignition



Model 12—2000-lb. Capacity—Chassis $1655 with electric starter, electric lights, magneto ignition and five-inch pneumatic cord tires.

Model 9—1½-Ton Capacity—Chassis—$2250

Model 7—2-Ton Capacity—Chassis $2875

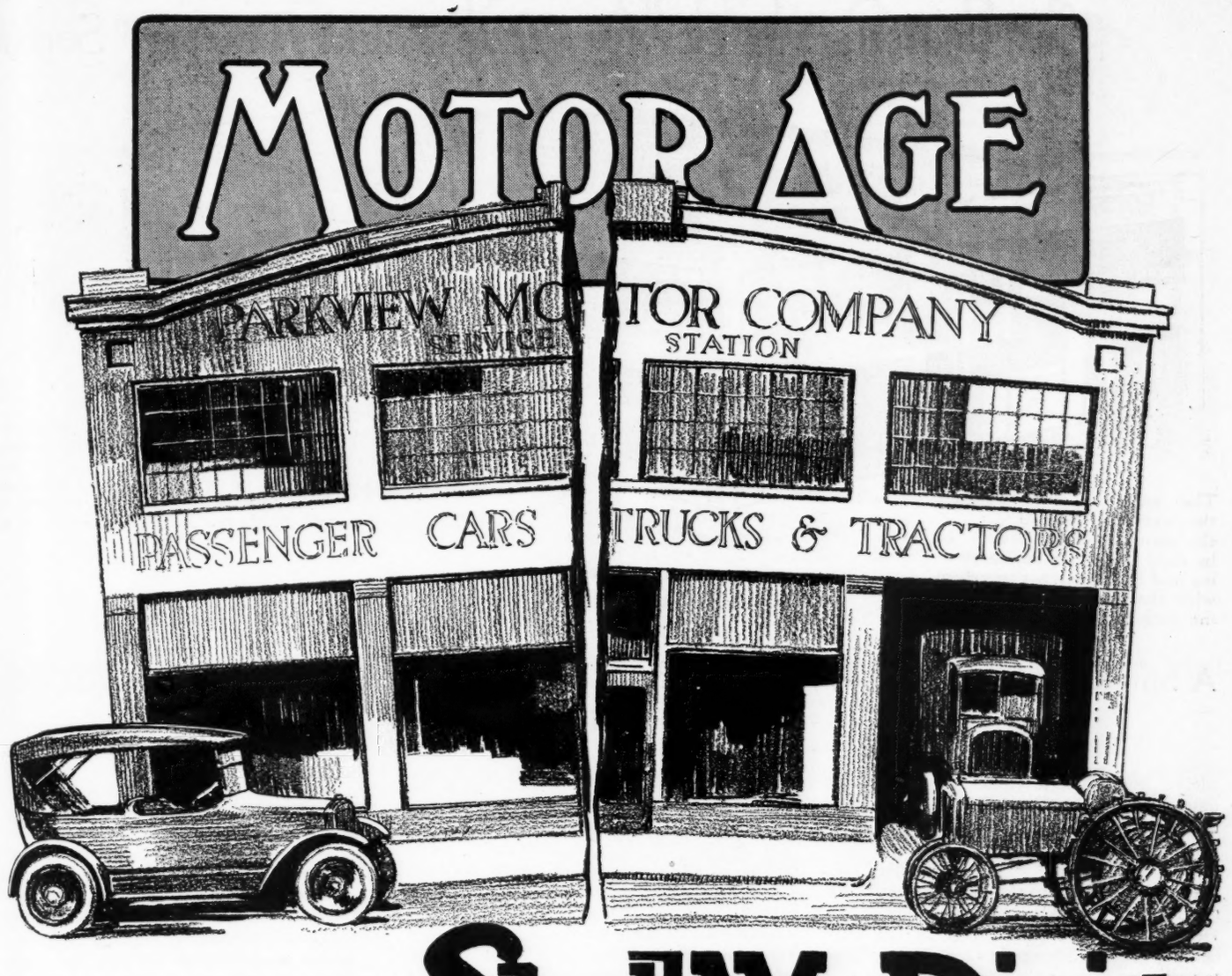


Model 10—3½-Ton Capacity—Chassis $3895

All prices f. o. b. Buffalo

Stewart Motor Corporation, Buffalo

Vol. XXXVII. No. 12 CHICAGO, MARCH 18, 1920 $3.00 Per Year



Shall We Divide Service?

Should Passenger Cars Be Serviced Separate From Motor Trucks and Tractors?

BY B. M. IKERT

EDITOR'S NOTE: Recent interviews with many dealers operating service departments for passenger cars, truck and tractors, have disclosed among other important thoughts the one of dividing service, by which we mean simply divorcing all service work on passenger cars from trucks and tractors. It is understood, of course, that this applies to dealers handling all three types of vehicles, or perhaps, just cars and trucks.

Dealers are going to be called upon more and more to take over the sales and service work of trucks and tractors and one of the first questions to confront them will be that of service. Much will be dictated by the dealer's present layout or possibilities for buildings in his city.

Many dealers claim that a single building is preferable to two or three buildings for service work. Others have it that it is best to keep your trucks and tractors entirely away from your passenger sales and service. There is a lot to be said on both sides and MOTOR AGE should like to hear expressions on the subject from dealers and service men.

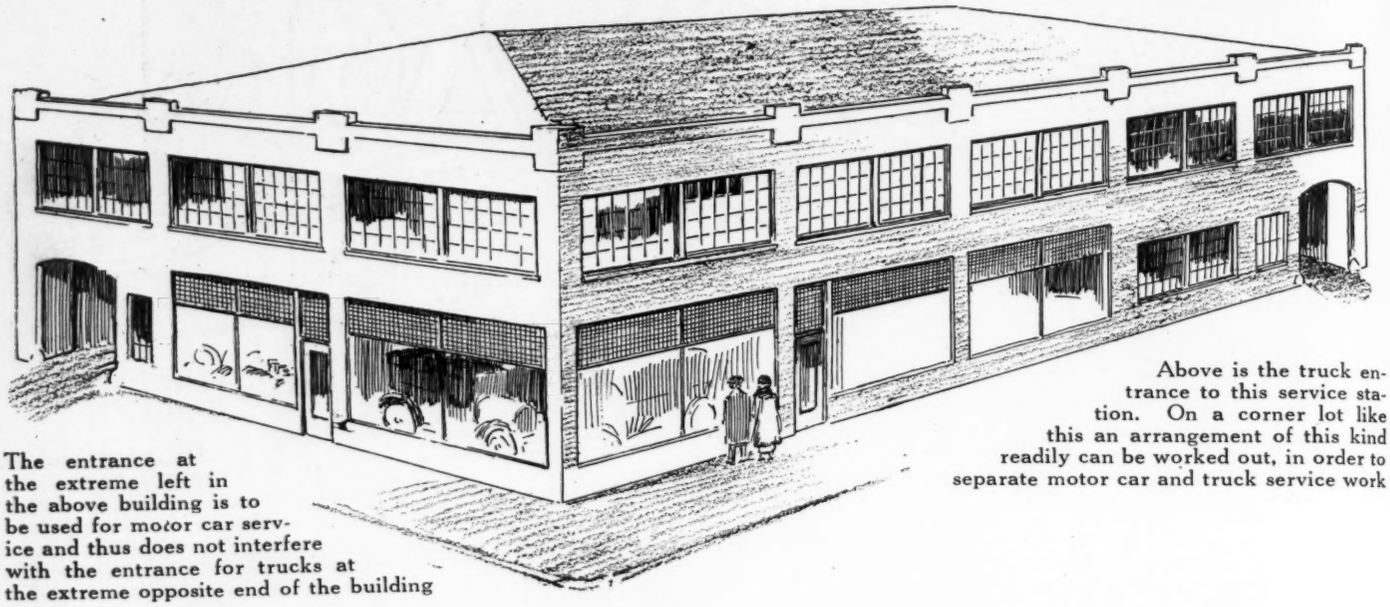
IF a dealer sells and services passenger cars, trucks and tractors or any combination of the three, should he or should he not service them separate.

Is it better, for instance, to have a separate building for rendering motor car service and thus divorce the work entirely from trucks or tractors? Or, should we treat the service work on all automotive vehicles in a like manner and house the whole proposition under one roof?

These are some of the major questions that come up from time to time in the maintenance of automotive products and are worthy of much serious discussion. Naturally the geographic location of the dealer's establishment, the number of cars he has out in his territory, potential market for vehicles, and many other factors must enter into the discussion.

Many motor dealers at the present time probably are debating the question as to whether or not they should take on a truck or tractor, realizing that the all important thought back of it all is the question of service. It does not take a great deal more room or number of men to sell additional automotive lines of ve-

Is It Better to Service Trucks and Tractors Separate Fr



The entrance at the extreme left in the above building is to be used for motor car service and thus does not interfere with the entrance for trucks at the extreme opposite end of the building

Above is the truck entrance to this service station. On a corner lot like this an arrangement of this kind readily can be worked out, in order to separate motor car and truck service work

A Single Building Like This Makes Possible One Shop, One Parts Department, One Accounting Department, Etc.

hicles, but when it comes to the service end of these that's where we must concentrate our thoughts.

Of course, it is possible to give service work on motor cars, trucks and tractors from a single building, but the question is, is this the best method, in view of the fact that much of the machinery and equipment necessary for motor car maintenance is not suited to the various needs of trucks and tractors, so that economical shop layouts, etc. are not always possible?

Why Everything in Threes?

Individual service buildings form cars, trucks and tractors mean three service superintendents, three shops, three lathes, perhaps, three welding outfits, in fact three everything. So, we come to questions something like this: Why have three welding outfits and three drill presses? Why three parts departments? And so you might go on naming countless other things that would have to be done in triplicate were cars, trucks and tractors all serviced from different buildings.

Sometimes there will be these conditions to meet. The dealer may be in a town and already well established so far as his sales and service on a passenger car is concerned. He might decide to take on the agency for a truck and the attendant service work of the latter. His present building may be only large enough to properly take care of his passenger car service work. Another building perhaps several blocks or a mile away for that matter, may be the only one available for his truck sales and service. Question is what shall he do.

After all it is a question of cutting down the overhead and this is being done by many dealers in various ways. Take the conditions cited in this paragraph as an example. The dealer in such a position might do this. He might take his present building and turn it over to the selling of cars and trucks only, with perhaps accessories, if he is handling them also. This would leave his other building free to be used for service work only, on both cars and trucks.

The advantage of this would be that his parts department could be housed in the service building under a single management, he could have a single large shop tooled up with the necessary machinery and apparatus to care for all work on both types of vehicles. After all a shop for handling truck work will not differ very much fundamentally from a shop designed for passenger car maintenance work. The greatest difference would be in the special wrenches, etc. used on particular makes of cars. Take welding, for instance, it matters little whether the job is one on trucks or passenger cars. It can be performed as well in one shop as in another.

IF you have one building for sales and service on cars, trucks and tractors, or just for service work alone, you then will have but one parts department, one accounting department, one repair shop and no matter how you might split these up into sub-divisions, the whole layout still will be under one roof and one management.

Bearing work is much the same on all engines and the same is true of valve or piston work. Naturally in the truck or tractor we have larger sizes to work with, but that does not materially affect the general layout of machine tools.

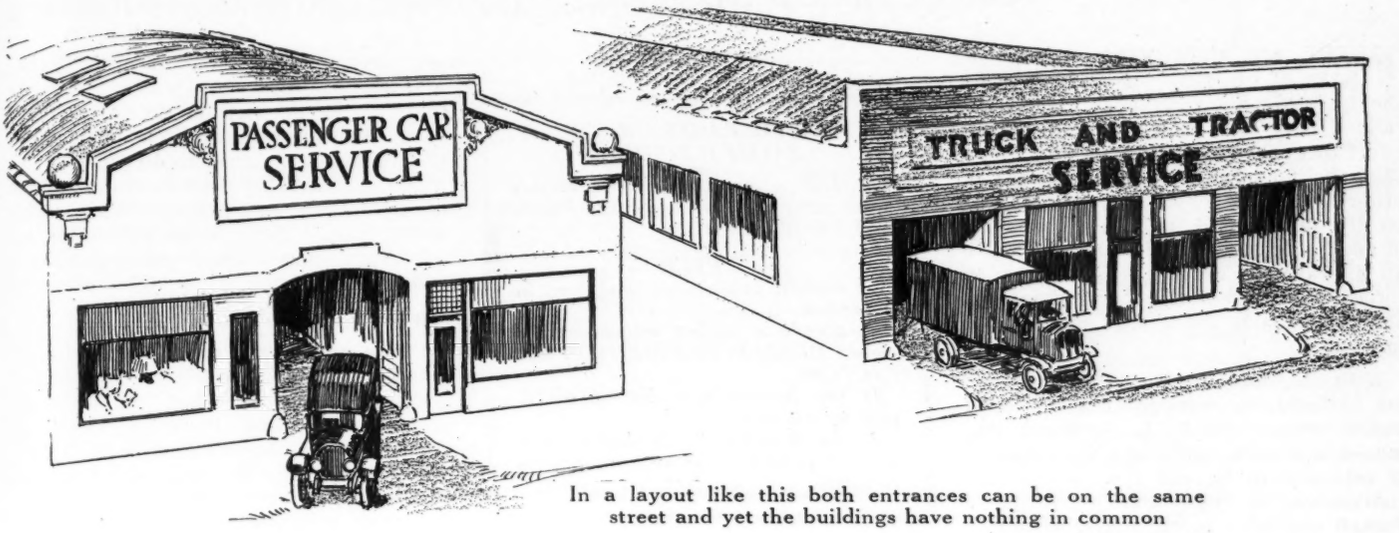
Where a dealer is putting up a new building he can, we believe, arrange his building in such a way that the selling and servicing of cars, trucks and tractors can conveniently be carried on. Thus it would be possible to have one large salesroom in which the whole line could be shown. There could be two entrances, one for the passenger cars and the other for trucks. If these were put on opposite sides of the building, there would be no interference and car owners would not be inconvenienced by having to wait on a line of trucks that might be trying to get into the service station accounting department.

Under One Management

A single building would make one possible and centralize the whole management of the business. While it, of course, would be desirable to have different departments to handle the work for the three lines of vehicles, these departments would still be under the same roof and while the accounting methods of the passenger car department might have little in common with those of the trucks, they would, nevertheless, be managed under a single head.

So far as the actual division of such a building is concerned, no attempt is made here to show this should be done, as there are many factors entering into the matter. At any rate it is best to keep

From Passenger Cars or Keep All Under One Roof?



In a layout like this both entrances can be on the same street and yet the buildings have nothing in common

Separate Buildings Mean Complete Divorce of Motor Car and Truck Service, But Also Mean a Duplication of Equipment

the respective floors for car and truck service divorced, and yet have them so arranged that both are handy to the elevator or parts department, main office, etc. Generally this can be done by having the parts department, etc. centrally located in the building, according ready access from the two service departments and also from the cash sales counter, usually placed somewhere near the salesroom. Also, if there is a shop upstairs, a dumb-waiter can be arranged to take care of the shop needs and might be worked in conjunction with the cage or tool room.

Adding Another Story

In these days of high building costs, dealers are reluctant about spreading out, but often much good can be done by putting on another story to the present building. It works out well in some cases where a ramp is put in so that cars can run directly from the street level to the second floor, where might be located the service department for passenger cars. The downstairs of such a place could be used for truck work.

In these days of ever-increasing use of automotive vehicles it stands to reason that our service buildings must be better arranged and the work better planned so that we can get satisfactory work on a maximum number of cars or trucks with a minimum amount of space at hand. One automotive dealer in the East has simplified his service work by taking on a line of tractors that use the same engine as that used in the truck he sells and services. This not only makes the same operations on both engines identical, but makes possible the reduction in the parts for these two jobs about 50 per cent. This is an excellent instance of where a dealer has worked out the problem of servicing trucks and tractors along with his motor cars.

The size of the town in which the dealer lives has much to do with the way in which he carries on his business and generally the larger the town the better the chances for getting service all under one roof. Bigger buildings are available and there are other facilities at hand.

IF service work on cars, trucks and tractors is split up so that more than one building are involved, it means duplication and triplication in some instances. There will be two or more repair shops, more machinery and equipment, perhaps more overhead, etc. Of course, local conditions have much to do with the case and often times it is easier to find two smaller buildings than one large one.

Not much has been said regarding tractor service thus far, which brings us to another point. With tractors a lot of the service will consist of shooting out a service car or truck to the farmer and doing the work right on the spot. In rare cases is it necessary to bring the tractor into the shop, excepting, perhaps in cases of the small two-plow machines which can be loaded on a truck and easily transported. The part of a tractor that requires most attention is the engine and this readily can be shipped out and brought into the service station and handled the same as any other engine. So, as far as tractor service is concerned, the dealer need not worry so much about space, nor need the shop be tooled up in any particular way other than putting in a special engine stand or the like to accommodate a particular engine, if the dealer has much of this class of work.

Cars Alongside Implements

Another point in tractors relates to power-farming equipment. The tractor is but the iron horse of the farm and its usefulness depends upon the drawn or driven implements that must go with it. Certainly the dealer who has taken on tractors will stock implements, but these hardly are in keeping with the rest of his wares on his salesroom floor. A disk harrow for instance does not look well alongside a $5000 passenger car. So, here again, the question comes up, shall we keep our power farm machinery and tractors in a separate building? If the dealer is handling all three lines, he might do as one enterprising dealer is doing and that is to keep his cars, trucks and tractors in one building, together with the service departments for them and house the farm machinery in another building across the street. The latter building is a single story affair and acts simply as a show room. The implements require no service and once sold they might as well be forgotten so far as their maintenance is concerned.

Again, if the implements must be housed in the same building along with the cars and trucks, the best plan is to put them in a room by themselves, or along with the tractors that might be on display. Some dealers have gotten

(*Continued on page* 32)

Making an Easy Job of

Can Be Done If Distributor's or Dealer's System of Ordering

By K. Herrick

THERE are right ways and wrong ways of ordering repair parts from the factory. Some methods are so arranged that there is a minimum of lost effort through the elimination of chances to make mistakes, and other modes of ordering are either so complicated, or, on the other hand, so general, instead of specific in instructions that they prove an aggravation as long as they are in force. In no season is promptness in arrival of parts more appreciated than in winter.

With the co-operation of the factory, the Philadelphia territory distributor of Denby trucks—the B. L. P. Motor Co., Inc.—has a system whereby the dispatch of returned parts and the arrival and distribution of new ones have been worked out with speed and efficiency.

Implicit instructions and charts to assist in ordering are supplied. The office system dovetails with the factory plan with notable smoothness, which means that the distributor is supplied promptly with exactly what is desired and the customer gets the benefit in real service.

MAKING PARTS ORDERS SATISFACTORILY

WHEN a truck dealer's customers need parts in winter—THEY NEED 'EM RIGHT AWAY.

—IT HELPS—

If explicit instructions are given in an order.

If there's a perfect understanding among DEALER, DISTRIBUTOR and FACTORY.

If the factory provides CHARTS with instructions.

If the distributor's or dealer's system of ordering and returning parts dovetails with the factory's system.

board of the seat and stamped on the frame, sometimes right-hand side near the front end. On some models the frame stamp will be found on the rear cross-member, about six in. from the right-hand side, or on the right-hand side about six in. from the rear end. The order sent always gives the number and name of part. In addition, it is the practice to write out plainly what is desired—leaving nothing to be inferred. It is considered better to take a couple of minutes at the start to do this than to waste considerable time hunting around at the factory and perhaps sending the wrong part. Being explicit in ordering will save unnecessary correspondence and annoying delays for the customer.

Right or Left Indicated

If the parts are "rights" and "lefts," it is always stated which are wanted, or both are mentioned when one or more of each is desired, it is impressed on the stockroom that "rights" and "lefts" are designated by the right or left as one sits in the driver's seat.

Here is where a mistake, for instance, could be made: Ordering "one set of connecting rod bearings," might be open to two interpretations. It might mean

How the Denby factory in Detroit charts its truck parts and groups of parts in models for the benefit of distributor, dealer and customer. In the grouping system key, the first number, 1, signifies "Engine Parts," the letter E signifies the size of the drawing on which the part is represented in the factory drafting room records and the final number is the number of the individual part

PARTS ORDER

Ship to_____ Order No._____

Address_____ Date_____ 191__

Ship Via_____ Terms_____

TO AVOID ERRORS AND DELAYS FILL IN ALL COLUMNS!

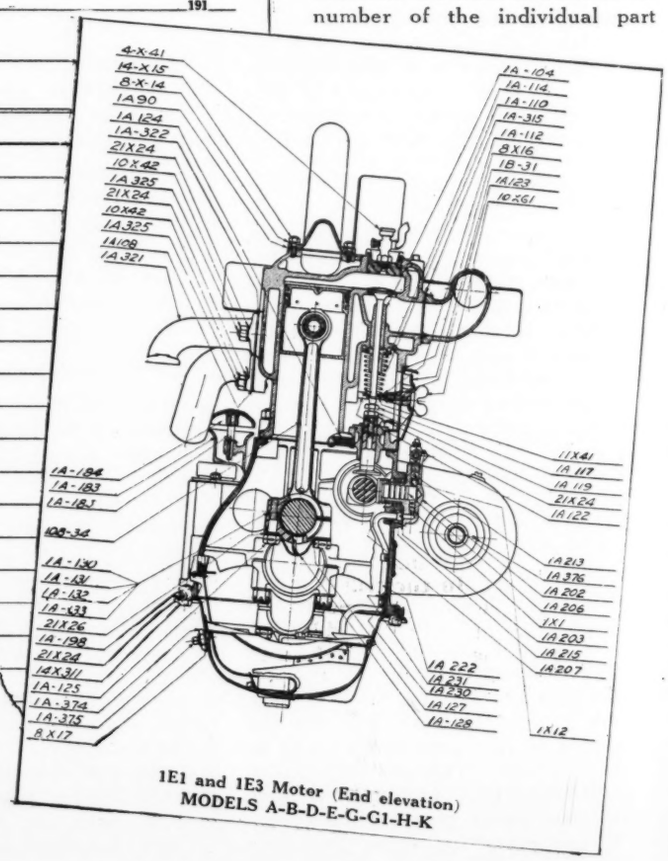
MODEL	CAR NUMBER	QUANTITY	PART NUMBER	DESCRIPTION

Here is an arrangement whereby the distributor makes known in the most intelligent and intelligible manner his wants with regard to repair parts from the factory.

The distributor never fails to give the number and model of the truck for which the parts are ordered. He never orders parts by simply giving their name, with capacity of truck.

The reason for this, is, if he should order a part for a one-ton truck, the factory would have no way of telling if it were a Model B, one-ton, or a Model R, one-ton, which happen to be in no way similar in construction. The Denby number and model always can be found on the capacity plate on the heel

Above — Parts order form used by the B. L. P. Motor Co., Inc., Philadelphia, in ordering parts from factory. It is made out in triplicate



1E1 and 1E3 Motor (End elevation)
MODELS A-B-D-E-G-G1-H-K

Ordering Repair Parts

and Returning Parts Dovetails with Factory's System

B. L. P. COMPANY — AUTOMOBILE & REPAIR ORDER — No. 2260

Deliver to _____ Date _____ 19__

_____ Car No. _____ Model _____

Charge _____ Coupon Book No. _____ When Promised _____

INSTRUCTIONS

You are hereby authorized to furnish all necessary materials and labor to make repairs as above.

Signed _____ Customer

Date Completed _____ 19__ Date Delivered _____ 19__

Invoiced _____ Delivered or Received by

Entered Sales Record _____

Form 7 — Name of Part _____ Price _____ No. _____

Date	Received	Sold	Balance	Date	Received	Sold	Balance

Order No. — CHARGE SHEET

MATERIALS, ETC.

Req. No.	ARTICLE	Sale Amount

LABOR

Date	Emp. No.	Hours	Rate	Sale Amount	Date	Emp. No.	Hours	Rate	Sale Amount

OUTSIDE WORK

Rate	BY WHOM AND PARTICULARS	Sale Amount

No. or Size _____ Article _____ Location _____ Unit _____ Max. _____ Min. _____

ON ORDER DATE	ON ORDER ORDER NO.	ON ORDER QUANTITY	RECEIPTS DATE	RECEIPTS ORDER NO.	RECEIPTS QUANTITY	DELIVERIES DATE	DELIVERIES ORDER NO.	DELIVERIES QUANTITY	DELIVERIES BALANCE	DELIVERIES DATE	DELIVERIES ORDER NO.	DELIVERIES QUANTITY	DELIVERIES BALANCE

The charge sheet above it the reverse side of the repair order and is fastened to the job

Top—Repair Order. This is made out in triplicate—a white office copy, having on its reverse the cost sheet; a yellow copy for the foreman, the reverse side being the charge sheet and the shop, or instruction card which is fastened to the job in a leatherette envelope with transparent face, mechanic checking off items as finished

Center—Type of small, white card used by service manager for his private tabulations. This contains history of truck with data handily set forth. It also records any queer knocks or other noises and their remedy

Bottom—Stock Card. It is a record of receipts and deliveries of parts for the B. L. P. Motor Co., Inc., Philadelphia

bearings for one connecting rod, or for four connecting rods.

If there is doubt concerning parts needed, the distributor will even send rough sketches of them, with principal dimensions, or the old part. This latter plan usually is followed.

When parts are returned, reasons always are given for return of part.

For convenience in ordering, each repair part number is made up of three symbols—a number and a letter, followed by another number. The first, or index number, indicates the group, or assembly on which the part is found. The letter indicates the size of the drawing in which the part is represented in the factory's drafting room records and the last number is the individual part number. Exceptions are the so-called standard parts, such as bolts, nuts, washers and studs, in which the middle letter in the part number is "X" The first or index number of each group of parts is as follows:

1—Engine parts.
2—Gasoline system.
3—Exhaust system.
4—Radiator system.
5—Ignition system.
6—(Omitted from group.)
7—Clutch parts.
8—Transmission parts.
9—Propeller shaft and universal joint parts.
10—Steering gear, brake and accelerator parts.
11—Rear axle parts and rear wheels.
12—Front axle parts and front wheels.
13—Front and rear springs, shackles and pins.
14—Frame and various brackets.
15—Hood, running-board, fenders, fender brackets, dash and seat.
16—Electric starting and lighting system and other special equipment.

For example: The combination 7A7 means clutch throw-out yoke; 8E1 refers to transmission assembly and 10B4 would be accelerator pedal.

In the Parts Order form used between the service station stockroom and the factory, appears the following legend, so that none of the precautions men-

tioned will be overlooked: "To avoid errors and delays, fill in all columns."

When the stock of parts in the bins is low, the stock manager fills out in long hand on one of these Parts Order forms what he wants. Usually he will nearly, if not quite fill it, from beginning to end, so that he will not have to send so often. He hands this written-out sheet to the stenographer, who types two copies, one being sent to the factory as the order and the other being retained for record.

Record of Receipts

When these orders have been filled by the factory and the articles have been received in the stockroom of the distributor, a stiff, buff stock card, eight by five in., is used to record the receipts, but it also contains a record of deliveries. The general headings of the columns are as follows: On Order, Receipts and Deliveries. Each of these general headings is subdivided as follows: Date, order number, and quantity. In the case of Receipts and Deliveries, there are columns to show the balance. On top of the card are spaces for: Number or size, of part, article (part's description); its bin location, unit, maximum and minimum.

When orders have not been filled, they are so checked off on the large Parts Order form retained, as mentioned before.

(Continued on page 32)

To Make an Easy Job of Ordering Repair Parts Use a Claim Tag Like This

CLAIM TAG NO. 359

To _____

Memorandum of Goods Returned for Credit.

Address _____

Shipped via _____ Checked Out by _____ Date _____

Quantity	Description	List	Discount	Net

Is Credit Due Customer yes. Who?

Invoice No. _____ Motor No. _____ Date Purchased _____

Credit Received _____ Memorandum No. _____

Amount _____ Correct _____ Credit Entered _____

Remarks _____

DUPLICATE CUSTOMER'S RECEIPT

B. L. P. MOTOR CO., Inc.
PARTS DEPARTMENT
502-04-06-08 NORTH BROAD STREET
Philadelphia, Pa.,

No. 6244 Sept 25 1919

Your Order _____
Our Order _____
Sold to Mrs Loraine Van Buren
Address _____ Ship Via _____
Terms _____
Ship to _____

CLAIMS ON ERROR OR SHORTAGE SHOULD BE REPORTED IMMEDIATELY
GOODS RETURNED FOR CREDIT MUST BE ACCOMPANIED BY THIS MEMORANDUM

QUANTITY	MODEL	PART NO.	DESCRIPTION	PRICE	AMOUNT
2400			3 Months Interest on 2nd Note 6/24-9/24		36 00
			Revenue Stamps		48
					36 48.

SOLD BY _____ RECEIPT ACKNOWLEDGED BY _____ TERMS OF SALE _____

PARTS NOT RETURNABLE AFTER ONE MONTH FROM DATE OF PURCHASE

TO Denby.
Address _____
From Mr. Smith.

B. L. P. MOTOR CO., Inc., Philadelphia, Pa.

MATERIAL RETURNED FOR CREDIT | CLAIM TAG No. 359

Description 1 1396 Spring hanger.

Motor No. _____

Reason for Returning Broken | Date 9/26/19

Above—Returned goods tag attached to part to be returned to factory. Note the card stub, which forms numbered claim tag and memorandum of goods returned for credit, when detached

B. L. P. Motor Co., Inc. Date, ... 19....

DELIVER TO BEARER

..... Car

Model..... Car No..... R. O. No.....

NOTE: This car should be carefully examined, as no claim for any shortage or damage to car while in our possession will be recognized after car leaves building.

Car signed for in good condition and with complete equipment

Signed, ...

Left—Cash sales slip made out in triplicate on a manifolding machine in the stock department of the B. L. P. Motor Co., Inc., Philadelphia. For charge sales on parts purchased, a smaller pink slip is used, a replica of this one and from it entries are transcribed to the charge sheet on the reverse of the foreman's copy of the repair order

Car release, authority for truck to leave building. No car is allowed to go without customer's signature on it

A Bonus System for Mechanics

THIS TOOL KIT CONSISTS OF THE FOLLOWING TOOLS

Employes' No. .....

TOOLS REPLACED AND RETURNED

1—No. 3Z645	⅜ in. L Socket Wrench
1—No. 2320	⅜ in. T. Socket Wrench.
1—No. 2335	Cyl. head cap screw Wrench
1—No. 1349	Hub cap Wrench
1—No. 1917	D. E. Wrench, Ford
1—No. 721	D. E. Wrench
1—No. 723	D. E. Wrench
1—No. 725	D. E. Wrench
1—No. 727	D. E. Wrench
1—No. 729	D. E. Wrench
1—No. 733	D. E. Wrench
1—No. 1411	Ratchet Wrench
1—	3 in. Screw Driver
1—	6 in. Screw Driver
1—	8 in. Screw Driver
1—	Pr. Diagonal Pliers
1—No. 1903	Pr. Ford Pliers
1—	No. 1 Hammer
1—	Stilson Wrench
1—	10 in. Cresent
1—	Putty Knife
1—	Oil Can
1—	Exhaust Pipe P. N Wrench
1—	Wheel Puller
1—	12 in. Punch
1—	6 in. Punch
1—	6 in. Cold Chisel
1—	8 in. Cold Chisel
1—No. 3Z616	Axle housing Wrench
1—No. 3Z1223B	Brace Socket Wrench
1—No. 5660	Walden Wrench
1—No. 5810	Walden Wrench
1—No. 6018	Walden Wrench
1—	Pr. Tin Snips
1—	
1—	
1—	
1—	
1—	
1—	
1—	
1—	
1—	

Date.....

In order to give mechanics every advantage on the time necessary to do a job, the Swaney Motor Co., Carrol, Iowa, furnished them with a set of tools containing the items shown above. The set of tools is the mechanic's as long as he stays with the company. If he loses a tool he pays for it, but if it breaks, the company stands the loss

A BONUS system for repair shop mechanics has been instituted in all six branches of the Swaney Motor Co., Carroll, Ia., which has introduced greater efficiency into the shops of the company, resulting in the doing of more and better work within a given time, and which appears to be perfectly satisfactory to the men.

This desirable result was reached after long and careful consideration and is based solely upon a time schedule. The plan is very simple once it is understood. From the employee's point of view, once it is installed, all that is necessary to keep it moving automatically is a good clerk to keep an accurate check on the time.

Every shop operation on a motor car has been carefully and conservatively figured on a time basis. For instance, it is assumed that a competent mechanic will overhaul an engine and transmission of a Ford car in 20 hr. An allowance of 13¾ hr. is placed upon the overhaul of the engine alone. An allowance of 4½ hr. is made for a rear axle overhaul, and so forth. The time allowance for some of the other common shop operations on a Ford car are given in the accompanying table.

Every operation is designated by a combination of numeral and letter and these never change. The shop foreman indicates on the mechanic's time ticket by using this characteristic what operation is to be performed. Posted in the

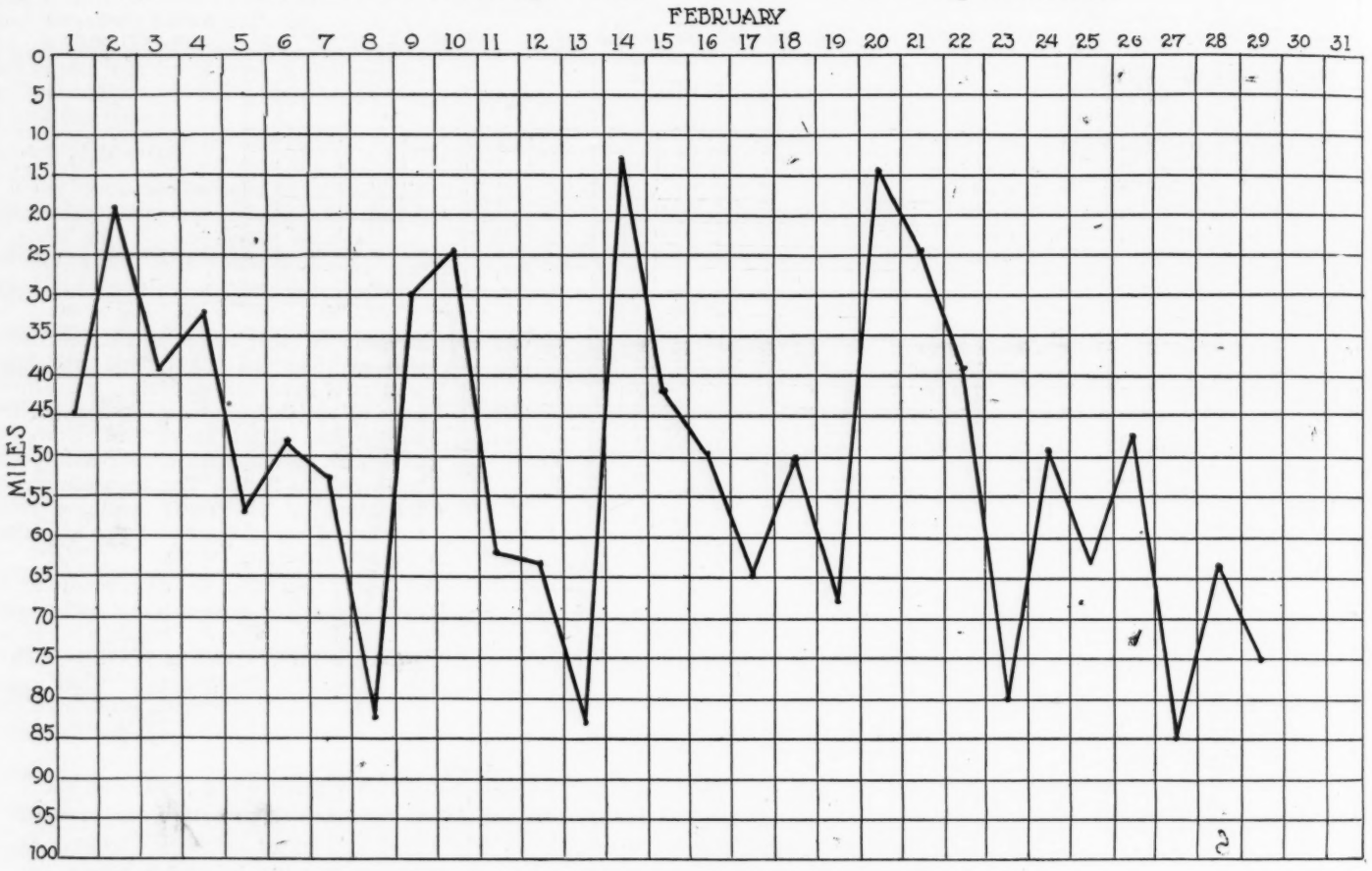
(*Continued on page* 32)

TIME REQUIRED FOR ONE MAN ON THE FOLLOWING OPERATIONS

		Hrs.	Min.
Valve guides		....	20
Push rod bushings		....	20
Bore cast bearings		....	45
1 A	Remove engine from frame	1	15
1 B	Disassembling engine parts	....	60
1 C	Rebore cylinders and grind valves	....	45
1 D	Babbitt cylinder block and put in rough caps	....	15
1 E	Bore babbitt in main bearings	....	15
1 F	Fillett main bearings, punch oil holes, cut grooves and assemble crankshaft to engine	1	15
1 G	Grind valves, fit camshaft bearings and assemble valves, camshaft and front cylinder **cover**	1	
	Grind valves	....	35
1 H	Assemble rods to new pistons and fit piston pins	....	15
1 I	Assemble rods and pistons to engine	....	30
1 J	Bolt engine to test block	....	15
1 M	Assemble coil and transmission to engine	....	20
1 N	Repair and braze crankcase	....	45
1 K	Replace magneto and magnets	1	
1 L	Overhaul transmission	1	20
1 O	Put on fan drive pulley and assemble crankcase and front cylinder cover to engine	1	15
1 P	Repair and assemble fan, cylinder head manifold and transmission ball cap	....	....
1 Q	Run engine in final test block	....	45
1 R	Install engine in frame	2	30
1 S	Make minor adjustments and tune up car	....	45
30 A	Rear axle out	....	15
30 B	Rear axle in	....	30
45 A	Front axle out	....	30
45 B	Front axle in	....	45
57 A	Radiator off	....	15
57 B	Radiator on	....	20
55 A	Fender off—rear	....	10
55 B	Render on—rear	....	15

Two Useful Ideas for the Dealer

No. 1—A Mileage Chart to Use With Repair Bills



HERE is shown a mileage chart that is useful in many ways. It might, for instance, be used in connection with your service car or truck to ascertain the total mileage every month and plot the resulting curve against similar curves for gasoline consumption, etc. It also acts as a check on the operation of a car. The car might, for example be laid up on a certain day for repairs of some kind and this immediately would show up on the mileage chart. On the other hand, if on a certain day the service car seems to have used up a considerable amount of oil and fuel, it may have been due to a long haul or many trips about the city. At any rate the chart would tell the story. In making the charts it is only necessary to write in the month at the top and locate spots for each day representing the maximum mileage covered by the vehicle on that day. In the above chart, for instance, the car went 25 miles on 10th of February and 68 miles on the 19th, and so on. This chart has been used by Charles Reis, Menard, Ill., who has found it very useful.

No. 2—Scheduling the Work to Be Done Each Day

DAILY SEQUENCE SHEET Date..... 19

	MAKE	JOB NUMBER	WORK TO BE DONE	OWNER'S NAME AND ADDRESS	TIME JOB ORDERED	TIME WANTED	TIME FINISHED

HERE is a facsimile of a sequence sheet used in the service department of the Overland Hanson Co., Waterloo, Iowa. The concern knows each morning just what is ahead in the way of service and repair work to be completed as a new sheet is made up each day with the unfinished items transferred.

Tractor's Life in Rice Fields Demands Good Service

Two views of a Hart-Parr tractor plowing in the rice fields, showing the adverse soil conditions

TRACTORS get about the hardest kind of use imaginable in the rice growing sections of this country and if there are any weak spots in the machines they are bound to show up here. Yet there is nothing mysterious about associating tractors with the rice-growing country. It is just a case of a good hard pull all the time.

It, therefore, readily will be seen that if service on tractors is at all important it is doubly so in Texas, and the other states growing rice. Dealers down here are carrying on service work in many different ways and on this page is printed an expression from one of the Southern dealers regarding tractor lubrication, a most important subject, especially when it is known that tractors are working under a heavy load all the time.

The Hart-Parr Co. has plowed in the rice fields for many years. In the old days the question of lugs on the heavy 60 hp. tractors was solved by using 4 in. by 4 in., bolted at right angles to the rims of the drive wheels. This cumbersome arrangement worked very well, but it remained for modern experience with the small, light tractors of to-day to really develop a lug which would keep the drive wheels from slip-

(Continued on Page 32)

Read What this Dealer Says About Tractor Lubrication

"WE sell service here right from the start. I do not mean by that that we merely tell a dealer how important a matter service is,—we do that, of course, that's part of our job. But what I really mean, is we sell the dealer not only the idea of service but also the physical means for giving service, along certain lines. Take lubricants, for instance. Everyone who has had any experience with tractors knows how large a percentage of his troubles come from faulty lubrication. Now, we are taking on a line of lubricants which has been thoroughly tested by the factory and so can be recommended for use with our tractors. This lubricant we sell to our dealers with the idea that they will in turn sell it to their customers. We sell our dealers on the idea, and we expect our dealers to sell the same idea to their customers, that a properly recommended lubricant is an insurance policy against trouble. Selling the right lubricant is a service in itself."—J. Lee Jackson, sales manager, Kibbe Tractor and Implement Co., Cletrac Distributor, Dallas, Texas.

Lapping Main and Connecting-Rod Bearings

New Type of Compound Simplifies Bearing Work to Large Extent—One-fourth Former Time Required.

FOR securing good fits in iron, steel, and often in aluminum wearing parts, the lapping process is that most commonly used. Lapping of main and connecting rod bearings, however, has been practically out of the question because of the tendency for the hard abrasive to stick in the bearing material, or the shaft, and continue to grind after the lapping operation has been completed. It is practically impossible to wash the shaft or bearing free of these lapping or grinding compounds and consequently they have not been used.

Recently a new type of compound has been brought out which breaks down after it has been in use for a short time. It is composed of large and small crystals, the cutting surface being the large crystal and the small crystal being a neutralizing substance. When the large crystal has been worn down so that the short crystals are in contact with the rubbing surfaces, these are broken up and, due to their neutralizing action, destroy the cutting qualities of the entire compound. This action generally requires about 10 min.

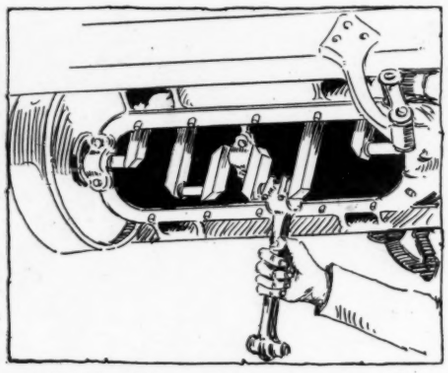


Fig. 2—After a shim is removed, compound and oil is applied to the bearings and the latter rocked back and forth a few times

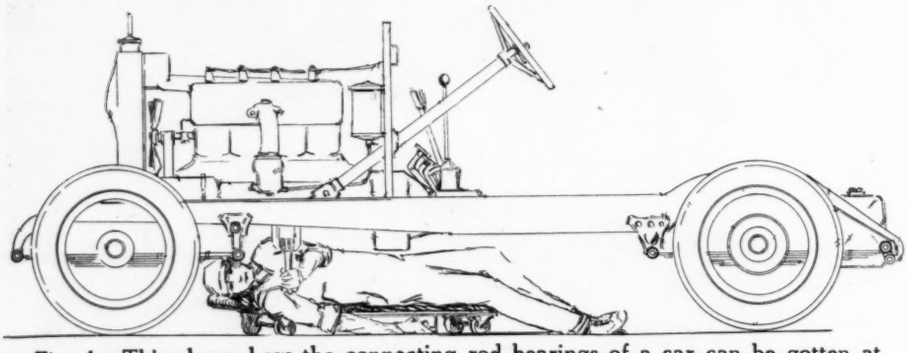


Fig. 1—This shows how the connecting rod bearings of a car can be gotten at by use of new cutting compound

New Compound Called Timesaver

This product is sold under the name of Timesaver and does not contain any form of emery, carborundum, or glass. It is stated that an 80 or 90 per cent bearing can be secured with it in about one-fourth of the time required to scrape the usual bearing. Timesaver is soluble in oil, or it can be removed with gasoline or distillate after the lapping operation is completed. It cannot be used for grinding valves, or lapping in pistons and rings as it does not work on iron or steel.

The method of using this compound is to bore or cast the solid bearings or bushings to a light driving fit on the shaft and grind in with Timesaver. This is applied very thinly and with plenty of oil. It is ground or lapped with a twisting and turning motion as of a coarse screw or thread. After a few twists have been given the shaft is cleaned and fresh compound applied. A number of other methods can be utilized. Fig. 1 shows car with engine in place and the bottom half of crankcase removed. The connecting rods being fitted to the crankshaft are in the reverse position, that is, hanging down.

Worked in By Hand

One shim is removed and connecting rod bolted up, just snug, with bearing compound and oil in the bearing, and rocked back and forth a few minutes, tightening the nuts as the babbitt grinds out. If one application does not produce the desired surface, repeat operation. A few minutes will generally produce desired results.

All connecting rod bearings can be fitted with the engine in one place, at one time, by removing caps, taking out one shim, applying bearing compound, assemble snug but not tight, rotate engine by hand, outside applied power, or its own power at low speed, or with its own started for about 2 or 3 min. This will usually finish a set of old bearings, but possibly two or three applications will be necessary on new bearings.

Fig. 4 shows a crankshaft in a lathe, all rods assembled on shaft, one shim re-

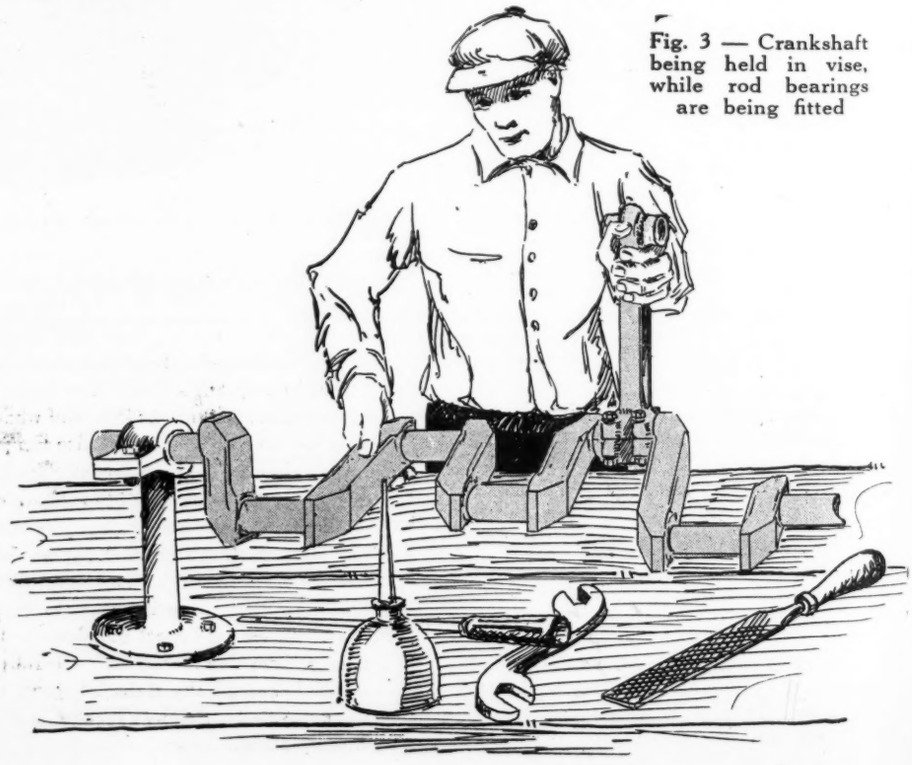


Fig. 3 — Crankshaft being held in vise, while rod bearings are being fitted

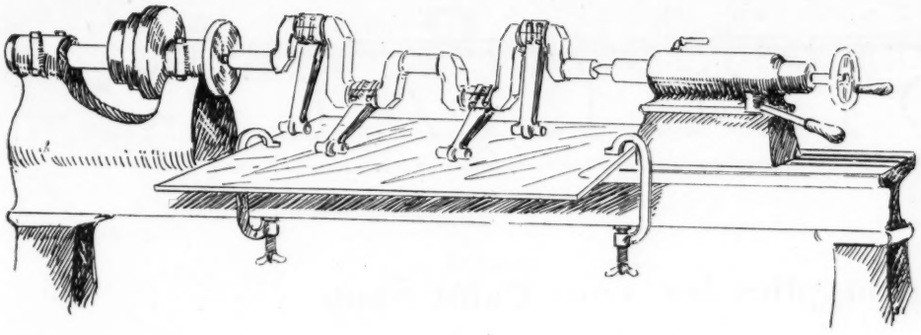


Fig. 4—Crankshaft in lathe, the latter being run at slow speed, allowing loose ends of rods to slide on metal surface

moved at a time and assembled so as to turn free, but not tight, and bearing compound put in the bearings with oil, small end of connecting rods resting and free to slide on sheet metal plate or board (-a) clamped to the lathe bed with C clamps. (b) The lathe is rotated at moderate speed and all rods are fitted at the same time. Shims removed and nuts tightened as the babbit grinds out, until a perfect fit is obtained.

Fig. 5 shows crankcase, upper half and cylinder block inverted. Place on stand or box, crankshaft roughly fitted to main bearings and compound applied, cap bolted in place lightly, shaft rotated by belt and pulley, as shown. Power furnished from small motor, line shaft, or a very good makeshift is to drop the cone belt from drill press and use it to drive crankshaft, using the foot clutch to start and stop the power.

Fig. 3 shows rods being fitted to the crankshaft. The crankshaft is held in a vise or special holder, rod bolted on with compound applied to bearing. Rock back and forth a few minutes, tighten up as babbitt grinds out, removing shim if necessary until fit is obtained.

It is claimed that bearings produced in this manner do not have to be assembled as tightly as a scraped bearing as there are no high spots to wear off and the bearing, if properly done, is a finished job. This product is being marketed by the M. T. K. Products Co. of Seattle, Wash.

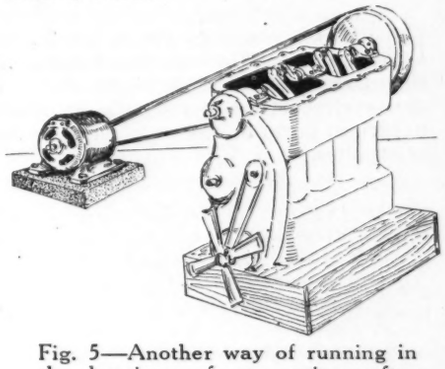
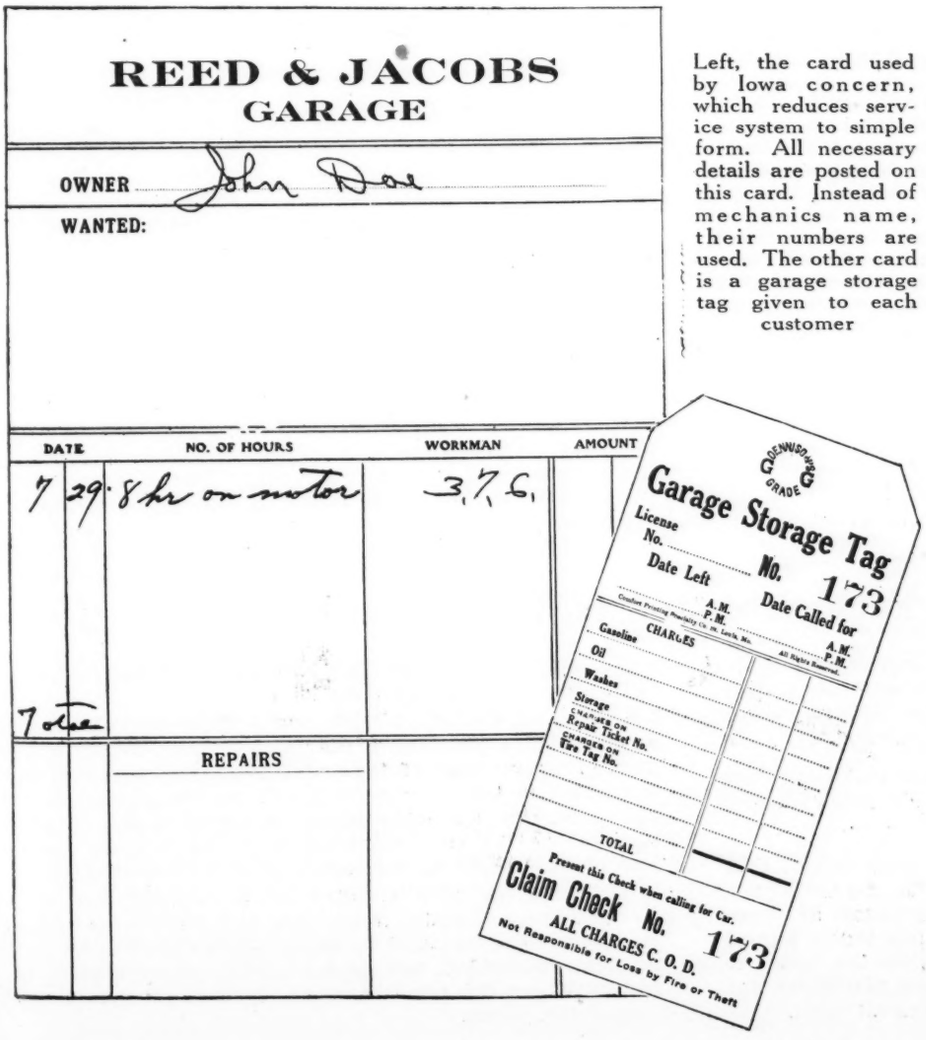


Fig. 5—Another way of running in the bearings of an engine, after compound has been applied to them

A Simple Service System



Left, the card used by Iowa concern, which reduces service system to simple form. All necessary details are posted on this card. Instead of mechanics name, their numbers are used. The other card is a garage storage tag given to each customer

A SIMPLE service system blank form has been worked out and successfully used by Reed & Jacobs Garage, Charles City, Iowa. It is in the form of a stiff paper card 6 by 9 in. with a hole punched at the top in order that it may be posted on a rack.

All the necessary details are noted on this card and in as simple a form as possible so that there is no waste of time, space, details or bookkeeping. The name of the car owner is placed at the top, followed by a blank space for listing what is wanted. Then follows space for date work is done, number of hours work put on the job each day, if it is a long job, workman's number, and amount of the day's work. This is all totaled at the foot of the space. Below this is a blank space for writing in the repairs that were put on the car.

Workman Has a Number

Workmen are each given a number to simplify the writing for the bookkeeper in filling out the blanks. This when filled out very quickly shows the amount due for all the repair work, what workmen worked on the job, number of hours work, and the repairs made. A garage storage tag is kept for the car which gives the license number, date left, date called for and hour. Charges for oil, gasoline, washes, storage and charges on repair ticket number given, and charges on tire tag number given, with total amount. A stub is torn from this for the car owner to redeem his car with number corresponding to tag number. This has to be presented before car can be removed from the garage.

EDITORIAL

Buying Supplies for Your Paint Shop

PERHAPS you are one of the dealers who this season is going to add a new department. This might be a paint shop and experience has shown that it is a lucrative field for the service station if scientifically handled. One of the most important parts in conducting a paint shop is judiciary buying of supplies.

HAPHAZARD buying of supplies or dealing with a party that offers the most attractive price regardless of the quality of the supplies generally is at the bottom of a very great proportion of the trouble encountered from the premature breaking down of highly finished surfaces on motor cars.

THE first sure step in the way of securing from your repainting business a line of supplies of dependable quality is to get in touch with a concern or concerns of established prestige and reliability. Having made this secure, hold fast to the advantage thus gained and if you make your trade and business practice of equal merit you will cash in on the way in which the business warrants.

PAINT shop supplies should be bought under careful supervision and inspection. If bought in this way it is more than likely that the seller will exercise greater care and consideration in making the quality and character of the consignment of the very best. If there were no such specifications laid down or rigid tests to which the supplies must be subjected there is danger of a dealer getting on hand a line of paints and varnishes that would not stand the test of time. Unscientific buying of painting materials, far more than the lack of standard practices of applying them to the surface, marks the way by which the profits of the business are diverted in part or absorbed altogether.

THE actual work of applying colors to car parts has been greatly simplified by use of the air brush, so that it is possible to turn out a re-paint job much more quickly than a few years ago. By thus having speeded up the processes of refinishing it is all the more important that the pigments and paint shop supplies be most carefully chosen, even though their initial cost may be higher than inferior products.

The Division of Service

EVERY now and then the question of separating truck and tractor service from passenger car service work presents itself to dealers and is truly a hard one to answer, especially in these days of high building costs and almost total absence of rentable buildings.

THE selling and servicing of a single make of passenger car or even several makes of cars is not nearly so great a problem as that of a car and truck, or car, truck and tractor. It is true that repair work on trucks and tractors involves much the same sort of machinery as that used in a shop exclusively catering to the motor car, but there are other factors that must be considered and that very often makes it advisable to divorce truck and tractor service and maintenance work from passenger car work.

TRUCKS are much more cumbersome than passenger cars and therefore take up considerable room in a service station, which is generally at a premium as it is. Then too, imagine a woman driving a sedan into a service station and having to dodge her way through a line of trucks. It sounds absurd to many dealers and yet these are some of the conditions to be encountered in some sections of the country, where the service departments still are considered as the general dumping grounds for owners to share their griefs.

WHERE possible it probably is the best plan to house trucks and tractor service separately from motor car service. But where but a single building is available the dealer has no recourse other than to change his layout so that service work on all types of vehicles will follow along efficient lines for those respective vehicles. One building for all, provided the building is divided properly, for instance, by running a wall through the length of the structure so that the service work incident to motor cars will not come in contact with that of trucks or tractors makes possible a single shop, single accounting department, single parts department, in fact, a single head under which all three classes of service can be run.

What the Service Station of Today Can Do

COMPARISON of the service methods in vogue seven or eight years ago with the methods in force to-day reveals perhaps as complete a change as can be effected in any business without altering its institutional concept.

AND the marvelous thing about it is, that that which was termed service in those days in this day is still called by the same name.

IN those times, service was that which some fellow, over in the Joe Bush Motors Co., kept in his head. He had the happy faculty of locating trouble, by intuition, by guess, or because he really knew. At any rate, this fellow located the trouble. Now we have this same fellow but added to his wonderful knowledge which enables him to analyze any trouble, he has a full line of service equipment tools. The tools make it possible for this fellow to do things that were formerly considered as factory jobs.

IN that time the task of removing a transmission from the chassis and changing a gear was a day's work for one man. Now we hear of the possibilities of performing this same task in ten minutes' time. Of course, all this is not due to the time and labor saving machinery, designing playing perhaps the most important part, but it gives one an idea of what has been accomplished in the service field.

CONSIDER cylinder grinding as it is done now days. Grinding a cylinder to one-half of a thousandth part of an inch is not considered as anything remarkable, but sever or eight years back, this accuracy was not attained in the factory where the car was made, speaking in general and comparative terms.

February Production Falls Off

Car Production for February

Car.	Estimate for 1920	January	February
Bour-Davis	.....	.....	430
Briscoe	30,000	1,000	500
Buick	200,000	15,000	14,000
Cadillac	25,000	400	1,100
Chalmers	15,000	1,200	1,050
Chevrolet	120,000	4,000	8,200
Cole	.....	.....	851
Columbia	8,000	600	425
Crow-Elkhart	.....	.....	15,100
Dodge	120,000	16,500	15,100
Dort	30,000	2,500	2,100
Elgin	.....	.....	983
Essex	40,000	3,750	4,050
Friend (A)	5,000	.....	.....
Ford	1,000,000	96,000	76,469
Gardner	.....	.....	160
Handley-Knight (B,	.....	.....	.....
Harroun (R-	.....	.....	.....
H. C. S.	.....	.....	.....
Hudson	30,000	3,000	3,600
Hupmobile	24,000	1,600	2,084
Jackson	6,500	100	150
Jacquet (I)	.....	.....	.....
King	10,500	200	260
LaFayette	.....	.....	.....
Leach-Biltwell	.....	.....	26
Liberty	15,000	350	600
Lincoln (O)	6,000	.....	.....
Lorraine	4,000	30	30
National	.....	.....	.....
Nelson	4,000	120	125
Marmon	.....	.....	550
Maxwell	80,000	6,700	6,100
Monroe	.....	.....	.....
Oakland	100,000	3,800	4,000
Oldsmobile	80,000	3,700	3,300
Overland	200,000	13,060	16,800
Packard	10,000	1,920	750
Paige	30,000	1,300	1,800
Paterson	3,000	220	250
Premier	.....	.....	171
Reo	22,000	1,200	1,100
Roamer	4,000	110	200
Scripps-Booth	20,000	750	700
Saxon	10,000	.....	.....
Spacke	.....	.....	450
Studebaker (X)	80,000	4,200	4,400
Stutz	.....	.....	287
Willys-Knight	80,000	.....	1,000
Wills-Lee	.....	.....	.....
Total	2,412,000	183,310	170,501

A—Friend Motor Corp., formerly Olympian Motor Corp., not yet in production on new FRIEND car.

B—Handley-Knight Co., not yet in production.

R—Harroun Motors Corp., recently refinanced, not yet in production.

O—Lincoln Motor Co. in production April 1.

Z—Saxon Motor Car Co. not in production on new car until March 1.

X—Report on Detroit plant. Production at South Bend just starting on new six.

C—Wills-Lee Corp. not in production until summer.

I—In production in April

PASSENGER car makers not only failed materially to increase their production for February, but actually fell behind the January total, and as a result the total output for the first two months of 1920 is considerably behind the numbers estimated for the year. Not only is the total production for February considerably under that for January, a fact which might at first seem to be accounted for by the fact that it is the "short month," but the daily average of cars made is considerably lower.

170,501 Cars in February.

In the Detroit district alone, for example, there was a total of 183,310 cars manufactured in the twenty-seven working days of January, an average of 6,789 a day, while the February total is only 147,568 for the twenty-four working days, an average of only 6,144 cars per day. This is a considerable falling off and as Detroit has the advantage over other cities in being the center of the industry, it is likely that other car making cities show even a greater falling off from the first month of the year.

It is probable that motordom in February really began to feel the first effects of the steel and coal strikes. It takes more than a week or two for the effects of a strike in a basic industry to be felt in all its force by allied industries, and we may expect that March will also show considerable effect from these two big strikes of the winter. Heroic efforts are being made by the manufacturers, however, to overcome their shortages of steel and coal and it may be that their efforts will speed up production to a slight extent.

Rumors Are Prevalent

All sorts of rumors and reports have been circulated regarding future car production. There was a wild report current in Chicago last week, for instance, that after July 1, there would be an embargo on steel for the automobile industry; that the steel mills throughout the United States were to devote their entire output to the rehabilitation of the railroads before they allowed a single pound of their product to any other industry. All efforts to trace this rumor were futile and motor car men in Detroit branded the report as "ridiculous on its face."

It is taxing the production engineers of the various automobile plants to get abreast of their production schedules and if they succeed, they can be looked upon as having achieved what now looks like the impossible. They probably will get up to their monthly production figures before summer, but each of the early months of the year is piling up a deficit in output which it is going to be mighty hard to reduce.

Besides production, makers also face the problem of storing cars until they can be delivered.

Big Boston Display Opens This Week

Two Buildings Are Used to House Exhibits of Cars and Trucks in Hub

BOSTON, March 13—With eighty-eight different makes of cars, gasoline, steam and electric, fifty-seven trucks, three tractors and hundreds of accessories, Boston's annual motor show opened its doors this afternoon for the 1920 season. This year two buildings are being used, Mechanic's building, the time honored structure where all previous shows have been held, and the Irvington Street armory, which is taking care of the overflow.

Instead of cars and trucks being separated as at New York and Chicago there are both kinds in each building. This is due to the fact that the Boston show is handled by the Boston Automobile Dealers' association, and as many of the members have truck lines as well as cars, they take space in Mechanic's building for both. Had it not been for the fact that the armory was available this year, the total of both cars and trucks would have been much smaller, for the management would not have leased any membership, and it is going to have a big banquet on Tuesday.

Manager Chester I. Campbell expects that there will be 3000 dealers and salesmen at the show this year. The price of admission has been advanced to 75 cents and this will include the war tax.

This year's show is more beautiful than ever. The decorator picked out the Annapolis Valley for his theme, and with the hard winter New England has had it is a delightful contrast to go into the show and feel the warmth of thousands of electric lights, the trees in bloom, the apple blossoms of Springtime.

ALBANY, ALA., TO HOLD SHOW

Albany, Ala., March 15—The Malone Motor show is to be held here the week of April 6. The show is staged by dealers of Albany and Decatur, Ala.

Denver's Show for the Rocky Mountain Region Combines Trucks and Passenger Cars Under One Roof

Colorado's New Mountain Playground
San Isabel National Forest
85,000 Visitors in 1919 ---- Motorists 48,000
For Information Write Secy. Pueblo Commerce Club

Upper left, a corner of the truck exhibit; upper right, the Colorado dealers advertised their scenery as well as their cars; lower right, a corner at the passenger car show

Toronto Dealers Have Annual Convention

Accessory Exhibit is a Feature of Meeting of Canadian Motor Car Men

TORONTO, Ont., March 12—The Retail Automobile, Garage and Accessory Dealers' Section of the Ontario Provincial Board of Retail Merchants' association met here last week with a big automotive equipment display in connection. Considerable business was transacted at the meetings, while entertainment features included several theatre and dinner parties.

It was announced that tire manufacturers have approved the association's tire contracts which are designed to drive "cut rate" dealers out of the trade and have also agreed not to appoint dealers outside the trade where it is possible to obtain "legitimate" representation.

This means that the practice of selling tires in stores unrelated to the automotive industry will be discouraged.

The following officers were elected for the coming year: S. H. Rowed, president; J. J. Duffas and Claude Pearce, vice-presidents; Roy Alex, treasurer, and W. C. Miller, secretary.

San Antonio Sets Pace in Show Decorations

"Prettiest Thing the Writer Ever Saw" Is the Verdict on Texas Exhibit

SAN ANTONIO, Texas, March 14—If the professional gentlemen who provide decorative surroundings for the big national automobile shows ever run shy on ideas they can get some pointers by coming to San Antonio. The Automobile Trades Association here put on a show last week which, from a decorative and artistic point of view, was the prettiest thing of the kind the writer ever saw. Fortunately the first unit of the new factory of the Lone Star Motor Truck and Tractor association was completed, but vacant, and its 500 by 81 feet of floor space was available. The building is of turret construction and thus is lighted during the day by light which filters down through the decorations from the turret windows. At night strings of incandescent bulbs concealed within the foliage give the same effect. It is one of the best lighted shows the industry ever saw.

Pendant from the roof are streamers of bunting, only the national colors being used. The floral effect is below, and from the floor almost conceals the flags. At regularly spaced points hang huge baskets of brilliant artificial flowers, while festooned from basket to basket are pendant strings of gray Spanish moss. No one can imagine the beautiful effect unless one has seen. At night these festoons of moss glitter and shine like frosted silver and the effect of the flowers and the silvery light is like fairyland. The pillars supporting the roof are banked with laurel.

Furthermore, every exhibit has bouquets and baskets of flowers on every vantage point to a total effect of a riot of color in harmonious blending. Artisically the San Antonio show is a triumph of the decorator's skill.

The exhibits, as far as automobiles are concerned, are confined to members of the association. Nevertheless, every inch of the space is filled and Manager Williamson says twice as much space easily could have been utilized. As it is, however, every member of the association is represented and the 500 foot vista as one looks down the aisles leads one to think that every car on earth must be present.

NATIONAL SHOW BIG SUCCESS

New York, March 14—New York and Chicago divided the honors this year in the two big shows held under the auspices of the National Automobile Chamber of Commerce.

Reports of the show committee submitted at the N. A. C. C. meeting here yesterday show that New York's paid attendance was considerably larger than Chicago's, but the business reported by dealers was greater in Chicago than in New York. Chicago's attendance was somewhat affected by the "flu" epidemic.

The returns to the exhibitors were the best of any of the shows under N. A. C. C. management. They were as follows:

New York Passenger Car Show, 130 per cent over best previous year.

New York Motor Truck Show, 88 per cent over best previous year.

Chicago Passenger Car Show, 72 per cent over best previous year.

Chicago Motor Truck Show, 75 per cent over best previous year.

Truck Shows to Be Changed in Future

Manufacturers and Dealers Are Dissatisfied With Conduct of National Exhibits

NEW YORK, March 13—A feeling in the motor truck industry that shows as conducted at the present time are not bringing the results expected from them was indicated at the recent meeting of the motor truck committee of the National Automobile Chamber of Commerce.

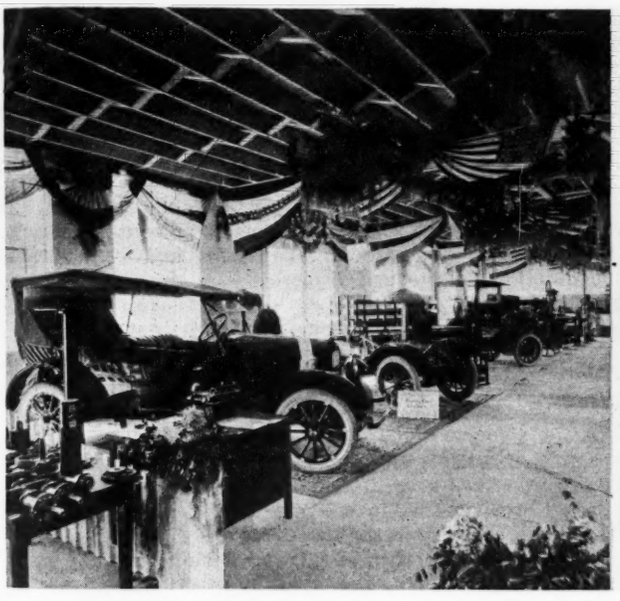
While a few of the companies represented reported that they were pleased with the results from the 1920 truck shows, a large number were of the opinion that changes should be made in the mode of exhibiting and demonstrating the trucks.

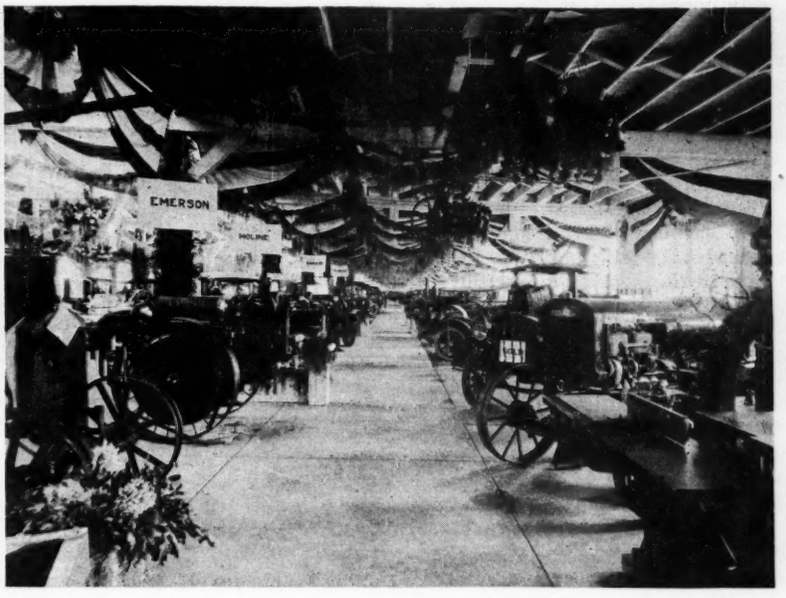
As a result of the discussion, opinions of the motor truck manufacturers are to be solicited and new plans for conducting future motor truck shows made at a special meeting of the show committee to be called within a few weeks.

ANTWERP TO HOLD BELGIAN SHOW

Paris, Feb. 18—The first Belgian postwar automobile show will be held at Antwerp from May 15 to June 13, on the occasion of the Olympic games. The exhibition will be open to all types of passenger cars, and accessories. From June 24 to July 25 the exhibition will comprise trucks, tractors, stationary engines, motor boats, and aviation engines. These two exhibitions are officially recognized by the manufacturers' associations of Belgium and France. Entries can be received up to and including March 1st.

"The Prettiest Show I Ever Saw"





Fred Loomis, who vistited the San Antonio exhibit, couldn't help but exclaim over the excellent way it was handled. And the photographs he sent us make us agree with his superlatives. The pictures show how trucks, tractors, car, and accessories all were handled under one roof and the profusion of floral decorations which obtained at the display

Oregon Plans for Much Road Work in the Coming Season

PORTLAND, Ore., March 14—This will be a big road year in Oregon, even greater than 1919, which broke all previous highway construction records in the state. The work so far planned for the present season far exceeds that of last year.

There are to be completed this year on 1919 contracts, 816 miles of road, or 250 miles more than were built last year. Greater progress in road construction will be accomplished in 1920 than last season for the good and sufficient reason that many contracts were let too late in 1919 for actual construction.

In 1919, road work under contract in Oregon aggregated 1361 miles, consisting of 375.8 miles of hard surface, 302.3 miles of macadam and 682.9 miles of grading. The contractors completed, according to the report of the state highway commission at the conclusion of its fiscal year, 544.1 miles, consisting of 163.1 miles of paving, 94.4 miles of macadam and 286.6 miles of grading.

This leaves 816.9 miles to be finished in 1920 on contracts let in 1919. This mileage is divided as follows: Paving, 212.7 miles; macadam, 207.9 miles; and grading, 392.3 miles. And this will be considerably increased by contracts awarded by the state highway commission in the coming summer.

Road work completed, under construction, or to be contracted for within the next few months in Oregon makes up a $30,000,000 road program, including Federal aid. On top of this, voters of the state are to pass on a measure at the primary election in May, authorizing an additional bond issue for road purposes of $10,000,000, and an amendment to the state constitution to authorize issuance of road bonds up to 4 per cent of the state's assessed valuation, instead of 2 per cent as at present.

Highway work at present is being concentrated on completion of the hard surfacing of the Pacific highway, from the California to the Washington state line, approximately 360 miles. This has been a stupendous job, for nearly the entire length of the road has had to be regraded and rebuilt, much of it being in mountainous country. The greater part of the highway will be hard-surfaced by the end of this year, and all of it by next summer.

The Columbia river highway, both upper and lower sections, is the other main center of highway work. The upper highway, from Portland to Cascade Locks, is famous throughout the world for its scenic beauties. But this scenic highway is now being extended on up the gorge of the Columbia river through scenery even grander in many respects than along the route already completed. Much of this construction has to be cut through solid rock. At one place, between Hood River and Mosier, the new highway passes through two rock tunnels 300 feet above the river.

The lower Columbia river highway, from Portland to Astoria near the mouth of the Columbia river, is also a scenic route. This highway, 105 miles, will all be paved by mid-summer.

Oregon is financing her large road bond issues by means of motor vehicle licenses and a state tax of one cent per gallon on gasoline and lubricating oils. Road construction this year will be benefitted to the extent of approximately $2,670,000 by revenue derived from the two sources, $475,000 of this amount being the estimated return from the gasoline tax.

An idea of the increased revenue for road purposes from motor vehicle licenses may be gained from the following summary showing gross receipts of the automobile department for the past five years: 1915, $108,881.50; 1916, $146,-254; 1917, $196,787.50; 1918, $461,422; 1919, $602,239. The license revenue for 1920 will be at least doubled, license fees having been more than doubled.

CHEVROLET PRICES RAISED

New York, March 14—General Motors announces that Chevrolet Motor Co. has advanced prices for all its passenger models $60 a car, the new schedule being effective March 1. The new prices follow: 490 chassis, $745; 490 roadster, $775; 490 touring, $795; 490 coupe, $1170; 490 sedan, $1245. F. B. model passenger roadster, $1270; F. B. touring, $1295; F. B. coupe, $1855; F. B. sedan, $1855.

These prices are all F. O. B. Flint, Mich.

ROLSTON HEADS VANCOUVER DEALERS

Vancouver, B. C., March 12—Fred Rolston was elected president of the Vancouver Motor Dealers' association at the annual meeting held here last week. Other officers chosen were M. Boswell, vice-president, R. J. Patrick, treasurer, and A. A. Ross, E. J. Parker and L. W. Pearson, members of the executive committee.

FORM NEW TRUCK BODY FIRM

Austin, Tex., March 12—D. J. Woodward of San Antonio and associates purchased the former radio aviation school and tract of 60 acres of land upon which it is located at Austin and are organizing a company to convert the establishment into one of the largest motor truck body manufacturing plants in the South. The property is known as Penn Field. The buildings now located upon the land were erected by the University of Texas for the War Department at a cost of $187,000. They are of brick construction and are equipped with water, electric light and power and modern sewerage. A spur railroad track gives them a transportation outlet. The company which is now being formed will have a capital stock of $500,000. No stock will be sold to outsiders.

It is the purpose of the new company to solve the labor problem by utilizing to a great extent the spare time of the students at the University of Texas. Realizing that there are hundreds of students compelled to work their way through college, the new company plans to give all who desire to take advantage of the offer board, lodging and laundry for a certain part of their time each day. One of the five buildings will be set aside for housing those who take up spare time work at the plant, and the company plans to furnish transportation to and from the university.

TO BUILD BIG SERVICE STATION

Wilkes-Barre, Pa., March 17—The contract has been awarded for the construction of a $90,000 garage for the Economy Automobile and Lackawanna Vulcanizing Co. of Wilkes-Barre, Pa., occupant, Gildersleeve estate, owner. The building to be erected on south Main street, between South and Ross streets, will be of fireproof construction and will measure 45 by 225 ft.

A feature of the garage will be an electric elevator, 13 by 27 ft., to be used for conveying cars to the second floor, on which the repairshop will be located. The building, in which there will be no center columns, will contain a large salesroom, showroom and considerable storage space.

DETROIT JOINS N. A. D. A.

Detroit, March 12—The Detroit Automobile Dealers' association has unanimously voted to affiliate with the National Automobile Dealers' association. Motion was made and seconded from several sections of the banquet hall, following a short talk by Guy O. Simons, representative of the National association in Michigan. Simons told the members, the various functions of the national body in behalf of the industry and dealers generally, and the unanimous vote followed quickly.

Reports of the success financially of the 1920 show were received enthusiastically, and a rising vote of thanks was given Manager H. H. Shuart and the directors, headed by Al. Zeckendorf, who staged the event. The report showed that receipts netted a handsome dividend, after payment of all expenses, and it was announced that the balance in the treasury at the beginning of the fiscal year April 1, including the annual dues, would approximate more than $20,000.

TO EMPHASIZE SERVICE WORK

Harrisburg, Pa., March 14—Service will be emphasized by the Phelps-Hughes Motor Co. in its new contract as agent for Selden trucks. This company, which has just been appointed Selden representative here, is a new concern. Mr. Phelps, formerly with the Selden Truck Co., of Rochester, N. Y., will at-

tend to the service end of the business and C. J. Hughes, formerly district manager for the Service Motor Truck Co., Wabash, Ind., will cover the sales end. The service will be located at 1336-1340 Thompson street, where a full line of parts will be carried. It is planned to establish a branch in Lancaster in the near future. The company also is negotiating for a new showroom, for this city.

DU PONT LOCATES AT MOORE, PA.

Wilmington, Del., March 12—The duPont Motors Corp., manufacturer of the new duPont car, has bought 8½ acres of land at Moore, Pa., between Wilmington and Philadelphia, where a plant will be erected for the manufacture of cars. The company will retain the plant here, where the first cars were made, for the manufacture of automobile and gas engines.

STEWART TRUCK RAISES PRICES

Buffalo, March 18—Price increases for Stewart motor trucks, to be effective Feb. 19, have been announced. The advances are as follows: Model 11, ¾-ton chassis, $1195 to $1350; model 9, 1½-ton truck, $1975 to $2250; model 7, 2-ton chassis, $2575 to $2875; model 10, 3½-ton chassis, $3500 to $3895.

NIAGARA FALLS BRIDGE ASSURED

Buffalo, March 12—Motor tourists will rejoice to learn that the long discussed Niagara river bridge is finally assured. Following return of the railroads to their former owners it was announced here that four lines will cooperate in the building of the bridge. The roads are the New York Central, Michigan Central, Toronto, Hamilton and Buffalo and Canadian Pacific.

The bridge will cross the river at Grand Island, the American terminus being in the River Road. A right of way across Grand Island, a distance of about three miles, is in possession of the railroads, and their lines will use this right of way to reach the portion of the bridge across the Canadian portion of the upper Niagara river channel, divided by the island.

There will be a vehicle roadway on the bridge, the first to span the Niagara Falls. It will eliminate a 60-mile tour or ferry passage which ourists have heretofore been forced to make to reach Buffalo from Canadian points.

Milwaukee Truck Men Plan for Summer Demonstration Tours

ILWAUKEE, Wis., Mar. 15—To drive home the possibilities of the motor truck as an economical necessity and labor-saver on the farm, arrangements have been made by The Milwaukee Sentinel, a leading newspaper of Milwaukee, to conduct a motor truck tour through the richest farming and dairying districts of Wisconsin during the week of June 21-26. The Sentinel in 1908 took the initiative in conducting the first reliability tour for passenger cars that was ever held in Wisconsin and at that time hung up a $1000 silver trophy which was competed for annually until 1914, when endurance run went into the discard. In its time the Sentinel trophy ranked second only to the famous Glidden cup in importance.

The truck tour will be open to trucks of ¾-ton to 3½-ton capacities ,and while it will not be strictly a competitive event, suitable trophies will be awarded to all trucks finishing on schedule time.

At the recent annual meeting in Milwaukee of the executive committee of the Yellowstone Trail Association, it was decided to conduct a truck tour over the entire length of the trail, from Cleveland, O., to Seattle, Wash. This probably will not be undertaken, however, provision is made for a highway bridge across the Missouri river at Mobridge, Mont., and the entire trail can be re-marked.

Interest in truck tours as one of the most favorable means of giving the commercial vehicle proper promotional publicity is at its heighth in Milwaukee. While the motor truck shows conducted in connection with the annual Milwaukee show have always been regarded as successful, it is believed that such showings must be supplemented by actual demonstration runs into the heart of the sections which form the merchandising field so that the prospective buyer may be brought face to face with the truck and be able to witness its performance under actual working conditions. It is recognized that while the cities are far from the point of saturation in the matter of motor truck absorption, probably the greatest field lies in the farms. To reach the farmer no better plan has yet been evolved than the motor truck tour.

FRANCE NEEDS 28,000 TRACTORS

Paris, Feb. 20—According to a statement just made by the French Ministry of Reconstruction, 28,000 agricultural tractors are required immediately for work in the devastated regions of France. In addition to these, 447,000 agricultural machines of various kinds are required immediately.

SEVEN TRACK LINES IN SOUTH

Atlanta, Ga., March 13—Seven motor express companies are now operating regular routes upwards of forty and fifty miles in Georgia and Tennessee, and have proven so successful that indications are the motor express may entirely replace railroad freight and express hauls for short distances in the course of time. Motor express offers a very quick means of transportation, much more so than freight or railroad express, and these companies are covering a radius around some of the larger towns and cities that enables retailers, wholesalers or manufacturers to ship merchandise and have it delivered the very same day.

At present the Pioneer Motor Express operates from Atlanta to Griffin, about forty miles, covering a dozen intermediate towns and villages, and return. Every trip finds the trucks well loaded. Out of Macon, Ga., Rowe Brothers' Transfer Co. operates to Fort Valley, Ga., and the Rome Transfer Co. operates to Forsyth, Ga.

In Tennessee the Merchants' Transportation Co. operates out of Greenville; the Teague Transfer Co. out of Knoxville; the Nolinger Transfer Co. out of Morristown; and the Gailbreth Transfer Co. out of Lenoir City.

"Better Be Safe Than Sorry"

The accompanying article which was sent to MOTOR AGE by its Atlanta correspondent reminds us of the familiar little piece of vaudeville pathos regarding the poor young woman who lighted her kitchen stove with a stick of dynamite. But the very frequency with which similar items find their way into print demonstrates the fact that repairmen are inclined to take too many chances with gasoline.

Atlanta, Ga.—While trying to solder a tank filled with gasoline, ————, proprietor of the ——— Garage, was seriously burned in the explosion which resulted. The car was demolished and entirely destroyed by the fire following the explosion.

Familiarity with the high explosive qualities of gasoline is likely to breed contempt and as a result disaster is likely to come. In fact, one of the most conservative repairmen of our acquaintance saw nothing remarkable about this item when it was shown to him—he said that he had often worked around gasoline tanks with a soldering iron himself.

But it's always better to be safe than sorry. It may take a little extra time to be sure that any gas tank you are working on is properly drained, but that little extra time and trouble is well worth while. Ten minutes to drain a tank and force a stream of air through it will seem a mighty small time to you when you are spending six months in a hospital recovering from burns.

Sixteen Entries Received for Los Angeles Race

Second Event of Season to Be Run in Heats With Championship Award to Fastest Driver.

LOS ANGELES, March 14—Sixteen entries for the sprint races which will be the second event of the season's program at the new Beverly Hills course here March 21 have been assured. Jimmy Murphy, winner of the inaugural race, Tommy Milton, Ralph De Palma, John De Palma, Roscoe Sarles, Joe Goodson, Joe Thomas, Eddie Pullen, Art Klein, Hill and White have already sent in their nominations while the Meteor car, driven by Ralph Mulford in the February race, also has been named, but its driver has not yet been announced.

Three heats of 50 miles each will be run. Two heats of eight starters each will be driven at first and the eight cars making the best time in these preliminaries will be lined up for the final heat at 50 miles. The starting order in this final heat will be determined by the time made in the preliminaries. A purse of $15,000 is hung up for the races and the man making the best average for 50 miles will be hailed as Los Angeles speedway champion for the year besides getting a special award.

This will be the last even on the new course until Thanksgiving Day when the last race of the National A.A.A. Championship will be run.

LINCOLN PLANS SERVICE BODY

Lincoln, Neb., March 15—Plans for the formation of a Service Managers' Association have been undertaken by Lincoln automotive dealers and it is expected the organization meeting of this association will be held in the near future. J. H. Markel and Wallace F. Boys of the Dodge Bros. agency here are the leaders in the new body.

Used car dealers and garage owners in this city have been hit by an ordinance recently passed by the councilmen forbidding the location of garages, service stations or sales agencies in non-fireproof buildings. Establishments for service or sale of automotive vehicles also are forbidden in any buildings used as hotel or rooming house.

NEWTON PLANS FOR ITS SHOW

Newton, Kan., March 15—The Harvey County passenger car and truck show is scheduled for Newton the week of March 25. L. W. Jones and A. G. Lindgren, secretary of the Associated Auto and Truck Dealers, are in charge of the display.

LAFAYETTE APPOINTS DISTRIBUTORS

Indianapolis, Ind., March 13—Organization of the distributor force for the Lafayette car is rapidly nearing completion and most of the larger cities of the United States have already been allotted. C. P. Rockwell, Inc., has been appointed distributor for Boston; the Gree-Robbins Co., San Francisco, have been appointed for northern California; the Troy Motor Sales Co., Los Angeles, for the southern part of that state; the H. H. May Motor Car Co. for Pittsburgh; the Hayward-Cameron Co., Inc., for Omaha; the Walker Motor Co. for Washington D. C.; Henry J. Smith for Chicago; Hugh T. Porter for New York; the Losey-Lafayette Motors Co. for Indianapolis and the Lafayette Motors, made up of R. A. Niccolls and R. R. Bush for Kansas City.

PACKER JOINS AMBU SCHOOL

Chicago, March 14—A. H. Packer, formerly associated with the Staver and Case passenger car factories and later with the Jones Electric Starter Co. and the Westinghouse Co., has been appointed to the teaching staff of the Ambu Engineering Institute here. Mr. Packer is a graduate of Armour Institute of Technology where he won the J. G. Brill Co. prize and medal.

Illinois Dealers to Reorganize Association

After Being Inactive for Several Years, Sucker Body to Reform at Springfield Meeting.

CHICAGO, March 12—The long quiescent Illinois Automotive Dealers' Association is at last to stir into activity with a convention and reorganization meeting March 22 and 23 in the State Capital building in Springfield. The Illinois association has been in a state of suspended animation for a number of years, nearly all of the work which rightfully belongs to a state organization having devolved upon the extremely live Chicago Automobile Trade Association.

Selection of the State Capital building for the convention is based upon psychological reasons. It is believed that a meeting there will serve to make the convention stand out more prominently than it could possible do otherwise and thereby attract outside interest.

It is estimated from 1000 to 2500 Illinois dealers will attend the sessions. The lower figure is the estimate of field secretaries of the National Automobile Dealers' association while the larger is the estimate of the optimistic Illinois workers.

BUILD MODEL SERVICE STATION

Des Moines, Iowa, March 12—The Hippee-States Co., jobbers of automotive equipment, have announced the construction of a five story, fireproof building to house their fast growing business. A feature of the new building will be a model, completely equipped service station, where it will be the aim to show every modern labor saving device used in garages and service stations.

Service Men Are Guests of Buick Company

New York Association Members Are Entertained by Gotham Branch of Firm—Shown Shop Methods.

NEW YORK, March 13—The New York Buick service station this week entertained twenty-five members of the Automotive Service Association of New York, Inc., by taking them on a trip through the plant. The trip followed a luncheon which was served at one of the up-town restaurants and Ernest V. Derks, service manager, was in charge of affairs. The party was divided into three groups, each group being provided with a guide and each party followed the normal course of a car going through the routine of the shop.

At the start, an explanation of how the service is sold was given, this supplementing Mr. Derks' talk at the last meeting of the association. Briefly, this consists in selling the customer satisfaction and not necessarily what he asks for. As an instance of this, it may be that he wants his connecting-rod bearings taken up. The tester finds on inspection that in addition to the rods, the main bearings are loose and that the cylinders need reboring as there is a piston slap. The service salesman, therefore, tries to sell an engine overhaul to the customer, pointing out that taking up on the connecting rods will only reduce the noise slightly and that he will be bound to come back soon for the other repairs, costing him more money in the end. The customers can usually be convinced of the truth of this and the proper repairs made to put the car in first class condition.

The guests were particularly interested in the stock room and the system of keeping track of the stock. This Buick branch carries a very large stock of parts because it is a distribution point for a large area having a great number of this make of car. The stock, with the exception of the fenders is kept in steel bins, marked with the name of the part, the price and the number. All parts belonging to one unit are kept in the same locality so that it is not hard to find things, even for a new man. The guests were taken to and from the station in a bus.

QUITS TEACHING FOR SERVICE WORK

Des Moines, Iowa, March 12—At least one Iowa school teacher has discovered a way to get his salary raised in spite of school boards. Ray Slingerland, a member of the high school faculty at Estherville, Iowa, has resigned his position with the schools, and with his brother-in-law has purchased a service station at Bolliver, Iowa. Mr. Slingerland decided that he could not wait for propaganda to make way for an increase in teachers' wages and is of the opinion that the motor car business offers a brighter future.

Deny Rumor that Steel Will be Shut Off to Makers

Report That Railroads Will Absorb Output After July 1 Is Termed "Absurd"

DETROIT, March 14—Reports that the automobile industry would be sacrificed by the steel manufacturers for the benefit of the railways are not taken seriously here. A rumor became current that the steel mills after July 1 would devote the entire output to the railways, leaving the automobile industry without any source of supply. Representatives of steel companies in Detroit characterize the report as ridiculous, and automobile executives declared they felt no concern on that score. They contend that the railways will demand only steel rails and heavy plate, while the automobile industry uses lighter plate and bars.

Where the effect will be felt most seriously is in the structural and building trades, which, of course, will have some effect on the automotive industry. However, there is no fear that conditions will be as bad as in the early winter, when manufacturers scraped their plants to dig up every ounce of steel, and many of them were paying enormous prices, and in many cases premiums and bonuses for steel.

Conditions today are much better than they have been for some time, and will continue to improve, according to men conversant with conditions in the steel market, and who are at all times alive to every move likely to have an effect on the industry. W. W. Raymond, of the Detroit Pressed Steel Co., F. J. Haynes, acting general manager of Dodge Brothers, and J. H. Main, purchasing agent of the Cadillac Motor Car Co. declared the steel crisis was passed sometime ago, and looked for conditions to improve steadily.

At least two leading Detroit automobile manufacturers, unable to get sheets of automobile quality in open market have paid $90 and $92 in Pittsburgh for from 3000 to 5000 tons of prompt open-hearth sheet bars, each which are being turned over to certain mills for conversion.

Most of the automobile factories caught when the shortage came in the winter, are accumulating a reserve wherever possible, despite the present high price, in order to safeguard themselves in the event of any emergency.

NEW CONCERN MAKES F. & W. PULLER

Indianapolis, March 12—The Indiana Metal Products Co. of Indianapolis, is now manufacturing the F. & W. Universal Wheel and Gear Puller, formerly manufactured by the F. & W. Mfg. Co. of Indianapolis.

HOWARD ENTERS AT INDIANAPOLIS

Indianapolis, March 15—Ray Howard, veteran driver, who attempted a comeback in the last Indianapolis 500-mile race, after an absence from the speed sport of more than ten years, has elected to give the wheel of fortune another whirl this season, and entered the eighth annual international 500-mile race on the Indianapolis Motor Speedway.

Howard will place his reliance upon one of the Peugeot fliers built for the 1914 Grand Prix of LeMans, which was called off due to the outbreak of the late world war. Arthur Duray, in a duplicate of this whippet of the gasoline sport, finished second of Rene Thomas in the Indianapolis contest of 1914, with an average of 80.99 miles per hour, consequently Howard is thought to have an excellent chance for first honors.

MACK HAS A NEW BRANCH

Cincinnati, March 9—A new branch house has been opened in Cincinnati by the International Motor Co. of New York, manufacturer of Mack trucks. The branch supersedes the James Kidney Co., formerly distributor for the territory, and will handle a complete line of trucks and parts.

Newark Service Men in Get-together Meet

Nearly 100 Members Attend Monthly Dinner of New Repair Men's Organization

NEWARK, N. J., March 14—Nearly 100 men in the automobile trade met last night at the Washington Restaurant in a get-together meeting to further the interests of the Automotive Service association of Newark. Dealers and branch managers were invited to listen to an outline of the objects and aims of the association and an appeal was made to these men to support this movement to the best of their ability. Al Rawson, president of the association, acted as chairman, and the speakers were J. H. Bell, president of the New Jersey Automobile Trades association; J. Howard Pile, secretary of the Automotive Service association of New York; L. V. Cram, production engineer, Marmon Motors Co.; H. R. Cobleigh, National Automobile Chamber of Commerce; E. V. Price, supervising field engineer, Prest-O-Lite Co.; J. E. Dougan, superintendent Boys' Vocational School; E. S. Foljambe, directing editor, Chilton publications.

Mr. Bell, taking the dealer's point of view, expressed himself as heartily in favor of the movement and told of the great harm that poor service can do to sales. Pile told of the great strides service is making, briefly described some of the flat rate systems which are revolutionizing service work and told what the New York association had accomplished. Cram spoke of the trend of design in engines and told of the actual working out of a plan for a new engine. The other speakers covered topics connected with service and told how the service departments were closely linked up with sales.

The dealers in attendance expressed themselves as heartily in favor of the association movement.

Seek Ways to End Car Shortage for Motors

Motor Men Confer With Railroad Officials in an Effort to Improve Conditions

WASHINGTON, March 11—Representatives of the traffic departments of a number of the large automobile companies headed by J. S. Marvin, general traffic manager of the National Automobile Chamber of Commerce conferred with representatives of the Car Section commission in Washington Wednesday over the car shipping situation.

In the past two years freight cars have not been restricted as to routing according to ownership. The heaviest production comes from the Michigan-Toledo zone and Mr. A. H. Smith, at that time Eastern Regional Director, placed an official at Detroit to supervise the distribution of automobile cars among the several roads each of which was then but a unit of the Federal system.

The change from Governmental to private control naturally changes this policy and it was with a view to obtaining rules and regulations covering the subject that the meeting was held. No formal action was required, the meeting being a general discussion of the points involved in these changes of railroad operation and the application of the new car service rules.

Those attending the meeting were: A. H. Brown, Nordyke-Marmon; C. R. Scharff, Chevrolet Co.; George C. Conn and A. H. Merrick, Buick Co.; E. A. Hodge, Hupp Motor Co.; W. R. Short, Studebaker Co.; George Main, Cadillac Co.; F. H. Thompson, Willys-Overland; W. G. Dibble, Hudson; J. H. Myler, Maxwell; J. S. Marvin and Pyke Johnson, National Automobile Chamber of Commerce, and Messrs. Kendall, McGarry, Barnes and Nelson of the Car Service Commission.

MARMON IN FAST TRIAL

Indianapolis, March 13—Another speed mark was established yesterday at the Indianapolis Motor Speedway when a Marmon 34 stock car was sent over a one-lap trial. The trial was the result of a wager that a car could not make one turn of the oval, 2½ miles, from a standing start, at the rate of 60 m.p.h. The car made the circuit in 2:22.4, an average of 63.2 m.p.h.

ST. LOUIS SHOWS REBUILT CARS

St. Louis, March 15—Rebuilt cars had their innings last week in St. Louis, the annual Used Car Show at the Southern Hotel building proving a magnet which drew good crowds. The shortage of new cars on the market brought numerous sales of rebuilt cars and trucks and prices obtained were, on the average, eminently satisfactory to the dealers who staged the event.

Illinois Road Program for 1920 Delayed Because of Cost

CHICAGO, March 13—Pulling Illinois out of the mud is a task which seems fraught with unusual difficulties and its accomplishment is once more delayed. At a conference between Frank I. Bennett, director of the public works department of highways; Thomas G. Vennum, assistant director; S. E. Bradt, superintendent of highways, and Clifford Older, chief highway engineer, held this week in Springfield, and with the approval of Gov. Frank O. Lowden, it was decided to confine Illinois' road building activities for 1920 to two projects, totaling thirty-nine miles of roadway.

Mounting costs of road construction are the cause of the latest Illinois delay. When the famous Illinois state bond issue of $60,000,000 was first proposed five or six years ago, road costs were estimated as considerably under $20,000 per mile. When the bond issue was voted in 1918, roads enthusiasts regretted they had not asked for $120,000,000 rather than $60,000,000. Now, it is estimated that it would cost about $200,000,000 to carry through the program originally outlined.

Bids were asked for numerous projects this spring and the lowest bid submitted called for $42,000 per mile of construction while the average cost per mile for all work which was proposed was approximately $44,000. These high costs decided state road officials to call off the road program until costs were lower and the only work which will be done this year will be along the Dixie Highway and National Old Trails road, for both of which there is considerable Federal Aid money available.

PENNSYLVANIA HAS ROAD SCHOOL

Harrisburg, Pa., March 14—Pennsylvania's road-building program is only in its infancy, Lewis S. Sadler, state highway commissioner, announced to nearly 300 inspectors and other employes of the state highway department who are spending two weeks here, in a special school arranged for their instruction. It is, in short, a conference on road construction and maintenance, of an informative character, in which the state's road improvement plans are being outlined by Commissioner Sadler. Technical papers will be read and addresses made.

The commissioner said that to improve all the roads in Pennsylvania on which improvements will be demanded by the people, will require a generation. Assistant State Highway Commissioner Geo. H. Biles; Chief Engineer W. D. Uhler; George G. Hatter, executive manager and P. M. Tobbs, construction engineer, also spoke to the inspectors along the lines of their work.

HARRISBURG TO GET ROAD

Harrisburg, Pa., March 15—Linking up Harrisburg and the Maryland state line by a durable highway will become a reality within a comparatively short time, it is announced by the State Highway department, as the result of an agreement reached between officials of the department and the Borough of Gettysburg. The highway department has agreed to construct a paved highway eighteen feet wide, on Carlisle and Baltimore streets, Gettysburg. This proposed construction will connect projects now under way north of Gettysburg and between Gettysburg and the Maryland State line.

AIMS TO CREATE HIGHWAYS DEPARTMENT

Washington, March 14—The creation of a national department of highways to be known as the Department of Highways, to construct and maintain a national system of motor truck highways, would be authorized by a bill introduced into the House by Congressman Raker. The term motor truck highways would mean roads with strength and capacity adapted to use by motor trucks engaged in transportation of heavy burdens and it would be a system free from toll charges. The purpose of this act is to ally motor truck highways with the general national highway system already authorized by a bill introduced earlier by Congressman Raker and providing for the establishment of a Department of Highways.

The bill authorizes the construction and maintenance of national highways by the national Government, with expenses borne by the Government, although the work of construction and maintenance shall be done through the State highway authorities under the general supervision of the Department of Highways.

The bill divides the nation into ten regional highway areas, authorizing the secretary over the Department of Highways to be appointed by the President, and a body of National Highway Commissioners, ten in number, representing agriculture, commerce, development of native resources, education and economics, manufacture, military engineering, motor truck transport, motor car travel and touring.

MOTORCYCLES IN POOR SHOWING

Paris, Feb. 20—Out of seventy motorcycles which left Paris for the 1000 miles reliability trial to Nice, only forty-five reached the destination under the conditions laid down by the rules. French machines were in a minority, but they never showed up very brilliantly, for with the exception of the 250 cc. light class, they only won one first prize.

These trials were based on regularity, hill climbing, silence, and brake tests. The highest number of points was won by an English Zenith machine with a 154.92 out of a possible 200. The best team performance was made by the English Scott machine, which won the President de la Republique prize, and secured second, third and fourth places in the 750 cc. class. These machines are two-cylinder, water-cooled 2-cycle type, and although well-known in England ran in France this year for the first time.

The American industry was represented by Indian and Harley-Davidson. The latter, in the sidecar class finished first, second, fifth, sixth and seventh. One of the two Indians finished the run, securing the fourth place in its class.

Ontario Men Make Plans for Good Roads Work for Year

TORONTO, Ont., March 12—Between 500 and 700 good roads' enthusiasts of Ontario attended the road conference for county road superintendents held in the Provincial Parliament building and the annual meeting of the Ontario Good Roads association held in the York Municipal building here last week.

Announcements of considerable interest to Canadians and Americans were made at the two meetings. The transprovincial highway from London to Windsor is to be via both the Talbot and Longwood Roads, a decision which has been under consideration for more than a year. County Councils were warned that if they did not keep their roads in good condition throughout the year, the Government would materially cut its maintenance grants until conditions had been improved.

Designation of additional roads to the transprovincial highway system added 1402 miles of thoroughfare to the 422 miles already included. This makes a total of 1824 miles of roads for which the Dominion and Provincial governments will each pay 40 per cent of the cost and the municipality through which they pay 20 per cent. For maintenance, the province will pay 70 per cent and the municipality 30 per cent. Cost of construction work in the next five years is estimated at $23,000,000.

INSTALL BUSSES IN DETROIT

Detroit, March 13—Motor bus transportation will start in Detroit May 15. The first line will be on Woodward avenue, and a complete unit of 20 busses with repair shop and other equipment will arrive in Detroit the first week in

May from New York, where they are being constructed. The company plans 2½ minute service, with a seat for every passenger. Seating capacity of the double-deck cars to be installed will be forty-eight persons, and when all seats are filled no stops will be made until vacancies begin to occur. Fares will be ten cents.

As evidence of the popularity of the motorbus in Detroit, many factory executives have appealed to the promoters to open lines to their plants, and this will be done wherever possible, just as rapidly as equipment can be secured. Routes will be extended to those part of the city only where there is no street car service, or where it is inadequate. Co-operation of the Board of Commerce, the Retail Merchants' Bureau and other civic organizations assure success for the enterprise. The personnel of the company includes some of the most prominent and progressive manufacturers and business men in Detroit.

PREDICT 35 CENT GASOLINE

Washington, March 13—An existing daily shortage of 3,000,000 gallons of gasoline is declared by oil men here, who predict that the price will advance to 35 cents a gallon within the next few months unless production or imports increase. Figures showing the exact production and consumption of gasoline during 1919 will be available shortly from the Bureau of Mines, Department of Interior, and are awaited with keen interest by the oil and automobile industries.

Already foreseeing an oil famine, both the Government and oil interests have commenced a survey of Mexico and Latin America to locate new fields of supply for this country. It is stated that between forty and fifty American oil companies have sent investigators to Latin America to explore and search for petroleum fields.

Georgia First in Southeast on Year's Road Program

ATLANTA, March 13—Georgia ranks first among the seven southeastern states, and second in the entire south, in the total mileage of good roads to be constructed this year, according to official figures that have recently been compiled by the Bureau of Roads, Department of Agriculture, at Washington. In the sixteen southern states it is estimated that 2671 miles of good roads will be constructed or improved, calling for an aggregate expenditure of nearly $25,000,000. This includes only definite projects, and there are several other agreements that have been reached between the federal and state governments not included in this estimate, that will swell the total to a much larger amount.

Texas leads the south, because of its size, with 607 as the total mileage, calling for an expenditure estimated at $3,508,278. Georgia ranks second in the south with 307 miles, to cost $1,725,798. North Carolina is third with 255 miles, to cost $1,716,100; Louisiana is fourth with 248 miles, to cost $2,037,244; and Alabama ranks fifth with 240 miles, to cost $1,053,587.

TO CONTROL TRAFFIC BY LIGHTS

Philadelphia, March 15—Experiments with new electric signals for controlling traffic throughout Philadelphia, suggested by Director Cortelyou of the Department of Public Safety, are being conducted by Chief McLaughlin, of the Electrical Bureau. The device calls for the regulation of traffic entirely by electric lights, both day and night and the abolition of the semaphore and the long vigil at an exposed and dangerous point by traffic police. Red and green lights, installed in inclosed lenses and attached to the ornamental electric light poles in the center of Broad street, or in other cases on special standards, will point north, south, east and west and the traffic policeman can control these lights by three push buttons, assuring accuracy in signaling.

To open north and south traffic, the policeman will push a button that will extinguish the red lights showing north and south, and turn on the green lights instead. The second button will work in the same way with the east and west while the third button is a master switch, turning off and on all the lights in the device.

GLIDDEN FATE IN BALANCE

New York, March 13—Whether there will be a Glidden Tour in 1920 is still doubtful owing to the fact that no actual entries have been received up to the present time.

The A. A. A., under whose auspices it will be conducted, has received assurance from several automobile manufacturers that cars will be entered if the tour is held, but the response from the entries sent out several weeks ago has not been of such a character as to absolutely insure the holding of the event.

In fact, the A. A. A. is making another appeal to those interested this week, and upon the replies will determine whether it will be run this year. The course, and the time of holding it have not been settled. However, the Lincoln Highway seems to be the favored course, and September the probable time.

CRITICIZES HOOSIER TRUCK SERVICE

Indianapolis, Ind., March 16—Are the motor truck dealers serving their function?

Members of the Indianapolis Transfer association at a dinner recently, at which the local motor truck dealers were invited, pointed out through various speakers how inefficient the motor truck dealers are in Indianapolis, and, if Indianapolis is no worse than other cities, the accusations made might be worth correcting.

"Why should a motor truck remain idle for a day or two days or three, while an Indianapolis motor truck agent sends to Detroit, or Lima, or Chicago, or other cities where motor trucks are manufactured, for a part? was one of the questions hurled by one of the large fleet owners.

"These truck dealers get a hole in the wall, try to do business with too little money invested, keep a dirty,

Tire Prices Go Up Along With the Rest of Motor Necessities

NEW YORK, March 8—An increase of 15 to 20 per cent in pneumatic tire prices, effective March 8, was expected in the trade here today. While there has been no official verification of the rumor, sources that in the past have proved authoritative are responsible for it, and there is an inclination here to accept the rumor at its face value.

It is pointed out that an increase is certain, due to the fact that the cost of cord fabric is now hovering between $2.35 and $2.50 a pound, an increase of 150 per cent over the price a year ago.

No appreciable increase is expected in solids. The price of rubber has not advanced materially and there seems to be a feeling in the industry that prices on the crude product may show a slight downward trend.

The industry has been somewhat embarassed by the decrease in tire prices that became effective May 12, 1919. It was announced only about two weeks before cotton for cord fabrics began to climb, and if the announcement had been deferred for another month, it is probable that it never would have been announced.

Since then there have been several moves toward an increase, but some of the leading spirits in the industry have succeeded in staving them off. The stage was all set for an increase in October, but it didn't come, and since then there have been a recurrence of the rumors.

It is believed, however, that the leaders of the industry who favor an increase have control, and that it is to become effective before March 15—with the chances favoring its announcement as effective March 8.

crowded salesroom and about enough parts to fill a ten bushel box, and call it service."

This man explained that a truck was idle all of one day because he could not find the part wanted, and then went to a machine shop and had the part made in two hours.

"Had I known that," he said, "the part could have been made between 7 and 9 o'clock in the morning."

And this man named over about all the Indianapolis dealers and said they were all derelict in their duties toward the truck owner. The truck dealers admitted certain laxities in their business.

INSPECT FORD'S GAS STREET CAR

Detroit, March 13—Henry Ford's new gas car, which it is proposed to install on the new municipally owned street railway lines, if Mayor Couzens's bond issue plan carries, was inspected yesterday at the Ford plant. Mayor Couzzens and members of the council saw the body mounted on the chassis, and were given all the details of construction and operation by C. E. Sorensen, Mr. Ford's general manager.

Sorensen said it would be a month and probably six weeks before the car would be ready for the test run to Chicago over the Michigan Central tracks. The city officials were much impressed with the car and it is believed the Ford car will prove a material factor in the voting on the bond issue. Detroiters' confidence in Ford and Sorensen and the fact that the new street cars are to be built at home is expected in a great measure to determine the issue.

GIVES TRUCK FIRM BUILDING

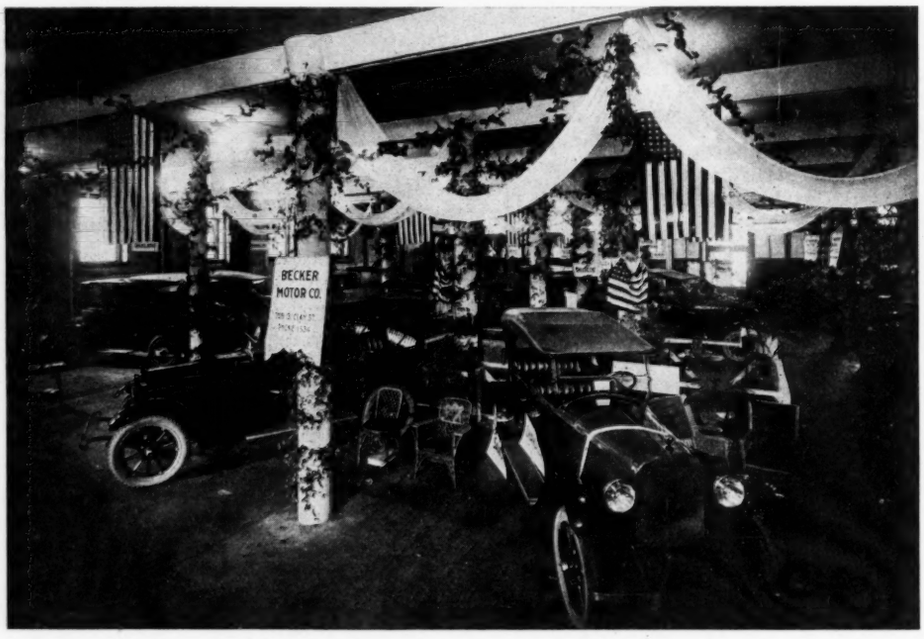
Ottumwa, Ia., March 14—The Iowa Motor Truck Co., manufacturers of the Bell truck, has recently been made a present of a building by the city of Ottumwa. The building was built a few years ago for a manufacturing concern which did not succeed, and to make Ottumwa attractive to Mr. Bell and his associates the city made them a present of the building, conditional upon the company remaining in Ottumwa for a specified number of years and maintaining a certain payroll. The building is two story, 300 by 225 ft., with two storage buildings and is located on trackage. It will greatly increase facilities and the company expects to put out 1000 trucks in 1920.

Fort Wayne Stages Biggest Annual Motor Car Display

FORT WAYNE, Ind., March 12—The best automobile show ever staged in Fort Wayne was put on during the week of March 2 to 6 by the Fort Wayne Auto Trade association. The show was held in the four story building formerly occupied by the Wolf & Dessauer department store, and the fact that the structure is very centrally located was a distinct advantage. One hundred models of forty different makes of cars were shown.

The cars were displayed on the first and second floors, while the accessories were displayed on the third floor. Decorations were particularly elaborate.

Fort Wayne Has "Best Ever"



A building formerly used as a department store housed the Fort Wayne motor car display this year

Green and white, the colors of the local association, were featured prominently. American flags were used in profusion and smilax was twined around the booths. Many visitors from surrounding cities were in attendance. At the registration booth 137 dealers from other cities registered.

A number of local firms which are engaged in rendering service to automobilists, either in the way of selling working clothing, washing cars, etc., had elaborate booths.

One of the interesting features in connection with the show was the manner in which a unique stunt to advertise it was put over. The Auto association offered prizes to those school children who would draw the most effective placards advertising the show. Thousands of children entered the contest and the winning posters were prominently displayed in store windows.

OUTLINES PLANS OF WILLS-LEE CORP.

Detroit, March 15—John R. Lee, associated with C. Harold Wills in the new corporation which will produce a high-class automobile in a plant being erected at Marysville, Mich., gave details of the plans for erecting a city of 60,000 persons, in a court proceeding in Port Huron this week. The statement, made under oath, is important in that it reveals the names of several of the parts manufacturers who will establish large plants in the new city. Mr. Lee announced that he would prefer to withhold the names of three or four others who will erect factories in Marysville.

The General Aluminum & Brass Co. already has bought a plant in South Port Huron and contracts have been let for its plant in Marysville, railroad sidings for which, have been laid. The Marysville plant of the General Aluminum Co. will occupy a 30-acre site.

The Detroit Gear & Machine Co. will erect a big plant near the site of the Wills-Lee factory and the Canadian Brass & Metals Co. has an immense plant well advanced.

Adjoining the General Aluminum site the Athol Manufacturing Co. of Athol, Mass., manufacturers of rubber cloth and other materials for automobile tops has secured a large site and started plant construction and the Williams Co. of Alliance, O., the largest producer of drop forgings in the United States, has begun construction of a $1,000,000 factory.

The Wills-Lee Corp. has foundations in for five new factory buildings which will be ready for occupancy April 1, furnishing 150,000 sq. ft. of working space. Three units of the larger four story factory will be built this spring adding 1,250,000 sq. ft. of floor space. The city is now being laid out and houses rapidly are being erected to accommodate the employees and their families.

The United States Steel Corp., it is said, will erect blast furnace and sheet mill near the site though no confirmation of this report is obtainable.

FULTON TO BE REORGANIZED

New York, March 7—It is understood that stockholders of the Fulton Motor Truck Co., which is to be sold at auction by John S. Sheppard, receiver, at Farmingdale, L. I., on March 11, have completed plans for the purchase of the

business at the sale and the reorganization of the company.

A man who has been president of a large truck company in the Middle West, whose name is withheld for the present, is said to have announced his willingness to subscribe heavily toward buying the business at the sale. He is slated for the presidency in the reorganization scheme.

Frederick Flynn, of New York, who is acting as trustee for the funds and is working in the interest of the stockholders through the Fulton Stockholders' Protective Committee, is authority for the statement that the property will be purchased by them.

The reorganization plan contemplates the incorporation of the Fulton Motors Corp. in Delaware with $150,000 capital Class A shares of $10 par stock and 350,000 Class B shares without par value. J. E. Conant & Co., Lowell, Mass., has arranged to hold the sale at the plant at 12:30 p. m. Thursday, March 11, in accordance with the decree of sale issued by Judge Learned Hand Jan. 28.

URGE CO-OPERATION IN TRACTOR FIELD

Rochester, March 8—Co-operation on the part of the manufacturer in the distribution of sales territory was urged here at the annual convention of the New York State Implement Vehicle Dealers' Association which ended here to-day. Considerable time was given at the convention to discussion of designation of territory. It was freely admitted that frequently contracts for territory between dealer and manufacturer are loosely drawn so that there is in reality no dead line accurately defining territorial limits.

Under such conditions the general certainty is reflected in the overlapping contracts. It was a notorious fact, it was brought out in the convention, that manufacturers sometimes get a little lax and permit overlapping of territory or the invasion of territory already assigned to a dealer. The consensus of opinion was for insistence by the dealer that the manufacturer fully co-operate.

Regret was voiced in the convention that the impression had gotten abroad in the public mind that there is any sort of a quarrel on between implement dealers and automobile dealers over which is entitled properly to handle farm tractors. It was asserted that there is no harsh feeling.

Tractor Men Quit the One National Exhibition Plan

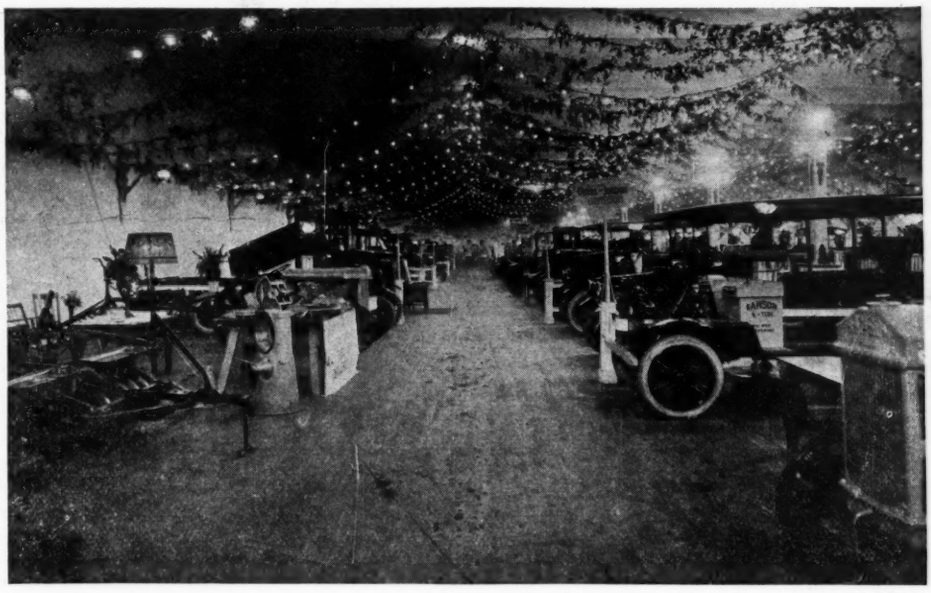
CHICAGO, March 11—Four sectional shows will supplant the one National Tractor Show which formerly has been held in Kansas City. Members of the Shows Committee of the National Implement and Vehicle association took action to this effect in a meeting held here this week and immediate investigations with a view to selection of the four cities in which the sectional shows are to be held have been set on foot.

For several years it has been felt that the idea of holding one national tractor show has been outgrown. Tractors suitable to one section of the United States are unsuitable to another, it is almost impossible to secure a representative dealer attendance from all parts of the country and the large numbers of different models of tractors now made in the United States renders it impossible to display all of them to advantage in a single display.

That the national show idea would be abandoned was forecast at the Kansas City exhibit this year. It was a foregone conclusion that the 1920 show would be the last one of its kind and that hereafter there would be sectional shows. Both manufacturers and dealers were behind this movement and the abolition of the national show merely resoved itself into a question of formal action by the shows committee.

The N. I. V. A. is not yet committed to any cities for its sectional displays, although it seems almost certain that Chicago will draw one of them. It is probable one show will be held in some city in the east, another in the middle west, another farther west and the fourth somewhere in the southwest. Determination of the cities which draw the exhibits will be based upon the provisions offered for local management, the location and amount of space available, the provisions for proper publicity and the provisions afforded for adequate hotel accommodations for visitors.

A Glimpse of Nashville's Show



The annual exhibit staged a few weeks ago at Nashville proved one of the most successful of the year in the south.

THE MOTOR CAR BREAKS INTO POLITICS

Austin, Tex., March 18.—For the first time in the history of politics in Texas the automobile has been injected as an issue of the campaign for the Democratic nomination for Governor. Former United States Senator Joseph W. Bailey who is one of the candidates for Governor is waging his campaign on the platform that there should be a return to the old ways of doing things. It is charged by his political opponents that Mr. Bailey wants the automobile abolished except for commercial and industrial purposes. Incidentally, it may be stated that Mr. Bailey has for years operated a large horse-breeding farm in Kentucky.

The record of Mr. Bailey on the automobile has been dug up and is being widely circulater with the view of making votes against him. When in the United States Senate he strongly favored driving all automobiles from the public highways. In the last days of the Taft administration, while the legislative, executive and judicial appropriation bill was under consideration, Mr. Bailey objected to an item which provided for the purchase of horses and carriages or automobiles for the use of the Vice-President and sought to have it amended so as to require the Vice-President to use a horse-driven carriage.

WINDSOR HOLDS BORDER SHOW

Windsor, Ont., March 12—The first annual show of Canadian border motor car manufacturers was held here last week and was so successful that it unquestionably will be continued as a regular feature. The show was originally planned as an exclusive exhibition for Canadian manufacturers, but was later thrown open to manufacturers in the United States. This resulted in a larger and more representative show than would otherwise have been possible.

Motoring in a New Style

Standard Snow Motor to be Manufactured in Seattle. Revolving Drums with Spirals Furnish Propelling Force

THE Standard Snow Motor, developed and now being perfected for quantity production by F. R. Burch of Seattle, Wash., is a unique application of the motor car power plant to a chassis designed to travel through snow. The propelling force is obtained by applying the principle of the ship's propeller to two revolving drums, turning in opposite directions, and having secured to them a series of spirals that forces the car ahead, just as a bolt is forced through a nut, when turned.

Standard snow motor which is being perfected for quantity production. It is claimed that there is no slip between the snow surface and the sled. That is, for a given number of revolutions of the drums, with a certain pitch of the spiral skates, the theoretical length of travel is actually maintained

The speed of the sled is changed by a special transmission through th econventional gear shifts. The steering is effected through an ordinary steering gear and levers connecting the front axle with the so-called runners.

The power plant of the Snow motor consists of a standard four-cylinder, four-cycle automobile or truck engine complete with radiator, pumps and magneto, etc.

The clutch is of the standard dry-plate type. The gearbox or transmission box is special in this respect—that ease of gear-shift is maintained through the use of constant mesh gears. This is required and will readily be understood when it is considered that there is hardly any momentum to the sleigh. In other words, as soon as the engine stops, or the clutch is thrown out, the sled will come to a stop, and for that reason an ordinary transmission box or selective type transmission would be harder to operate; however, the actual gear shifting is done through a conventional selective transmission type used in automobiles or trucks.

Special Design Gearshift

The power is transmitted from the gearbox as described, to one special gear drive or distributing box having three gears, the drive pinion from engine directly meshing with only one of these gears; the lower two gears again meshing one with another, and driving through separate shafts to centrally located sprockets through chains to main drive sprockets located in between the two drums, giving these drums a rotation opposite to one another.

The drums, which are somewhat of a cigar or egg shaped form, easily furnish the most interesting point of construction, as it is entirely new and therefore its application quite novel. The shape of these drums is a very important factor, as they have several functions to perform:

Drum Shape Important

First—They must be of such size, presenting sufficient surface to carry practically the entire weight of the machine.

Secondly—They must be so shaped as to form the least resistance against the snow surface and sled propulsion, and must be so arranged or designed that certain portions of them will pack the snow for proper working of the spiral formed skates fastened to drums.

Thirdly—The drums must be made perfectly cylindrical in shape as far as any transverse section is concerned, and must be perfectly smooth.

With any given engine power and gear ratio giving a definite number of revolutions of the drums, it is readily understood that the proper pitch of the skates fastened to drums can be arrived at. It is particularly interesting to note that there is absolutely no slip between the snow surface or road, and sled. In other words, for a given number of revolutions of the drums with a certain pitch of the skates, giving the theoretical length of travel, this travel is actually maintained when using the machine. This, of course, will be appreciated when it is considered that no power is wasted through slippage.

It is interesting to note that these steel skates are of a very shallow depth, probably not over five-eighths of an inch high, requiring ordinarily much less than this on a hard packed road, or on frozen snow. With new or wet snow this depth of five-eighths of an inch has proven to be sufficient.

The drums are made of pressed steel securely fastened by means of flanges and spiders to the driveshaft, and due to the shape and construction, they are very light.

The driveshaft is made of alloy steel carried in four roller bearings fastened to a steel truss, and guided at each end by means of a bearing square on the outside, fitting into vertical guides fastened on to superstructure of car. These end guides are another very important feature of this machine, as they keep these two drumshafts parallel in a vertical plane. The other object of these vertical guides is to allow the drums and drumshaft which are supported on a central pivot, to oscillate around this point in order to conform to the roadbed, and which motion is absolutely independent for either one of the two sets of drums. The drums carry most of the superstructure of the car. Some of this weight, however, is carried by the runners. The idea of this is to give these necessary weight in order to facilitate steering.

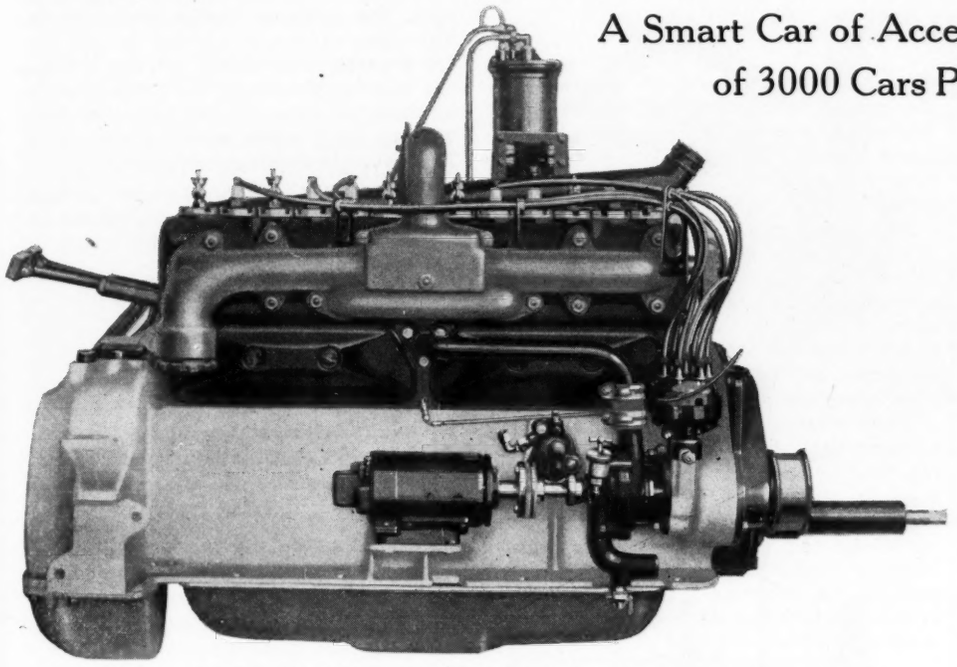
Power Can Be Varied

The tractive force of the sled is something that of course can be varied by the power plant and consequently can be made to handle light or heavy material as required.

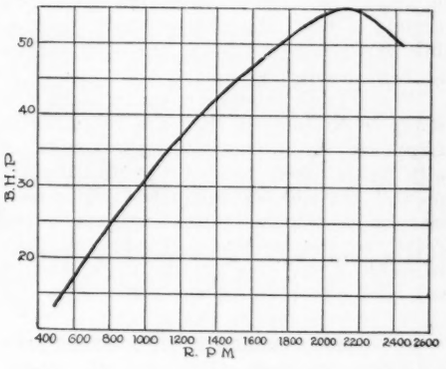
The Standard Snow motor will be manufactured in Seattle and it is the intention of the company to make one thousand sleds this year. The men behind the company are well known nationally.

Severin Six a Western Product

A Smart Car of Accepted Units—Production of 3000 Cars Planned This Year



The Continental 9-N engine, with which the Severin Six is equipped



The horsepower curve of the Severin engine develops over 55 at its peak, of 2,100 r.p.m.

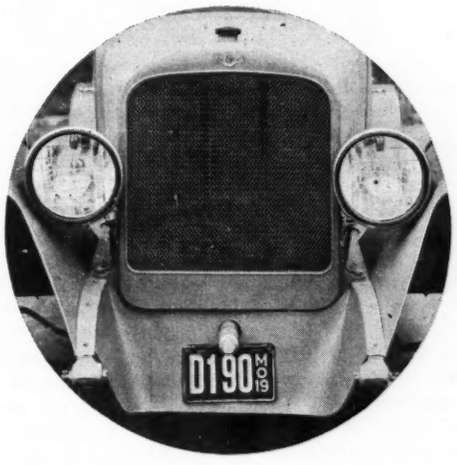
ONE of the most important features in connection with the building of the Severin Six, a product of Kansas City, is that dealers handling the car will be reasonably sure of delivery, for the company is well fortified in its supplies and materials, for the production of 3000 cars during the year. The car is assembled from such units as are familiar to all. The well-known Continental engine together with the Muncie transmission, and the Borg & Beck clutch form the unit power plant. Peters' universal joints transmit the power through the hollow propeller-shaft to the rear axle, a Salisbury, of the heavy duty type.

Continental Engine Used

The engine used in the Severin Six, is the large Continental, model 9-N, whose bore and stroke is 3½ in. by 5¼ in. The crankshaft of this engine is of the three bearing type and is sufficiently large in diameter to insure the elimination of engine vibration throughout the whole range of engine speed. The r.p.m. at which maximum hp. is developed is 1900 and at this speed the engine develops 55 hp. The lubricating system on this engine is of the force and splash type; a plunger driven from an eccentric on the camshaft drains the reservoir in the bottom of the crankcase and forces it to the main bearings through individual leads to each bearing. An extra lead furnishes oil to the timing gears. The splash from the overflow lubricates the cylinder wall, wrist-pins, the tappets are also lubricated by this mist which gains access to the tappet passage through the wire gauze breather holes.

The wheelbase of the Severin Six is 122 in. A 7-in. channel section forms the frame which is of Parish & Bingham construction. The chassis is supported on Perfection springs measuring 39 in. in length for the front and 54 in. for the rear. The leaves in both front and rear spring are 2 in. wide. The steering gear is Lavigne make and is of the worm and worm wheel type.

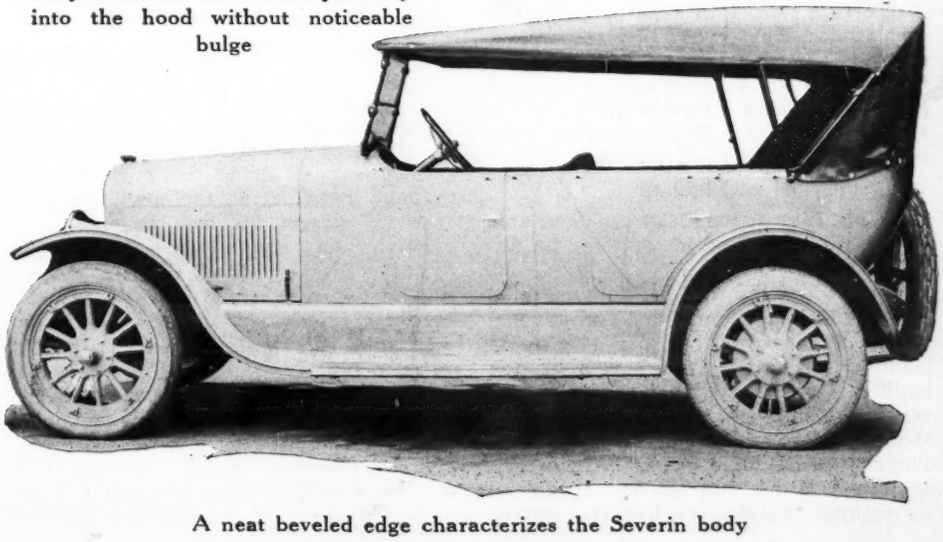
The electric system is of Wagner make throughout. The starting and lighting is of two unit type with the distributer independently driven. A Campbell 6-volt battery is used.



The Severin from the front. The radiator is of the square type with body contours that blend perfectly into the hood without noticeable bulge

Genuine Leather Upholstery

A smart bevel-edge characterizes the body, which is low hung and in which ample leg room is provided. Upholstering is in genuine leather with deep and ample seat cushions to add to the comfort of the occupants. Curtains that open with the doors are provided for inclement weather. The car is equipped with 32 by 4 tires which with the 4½ gear ratio in the rear axle enables it to attain a speed of over 60 m.p.h.



A neat beveled edge characterizes the Severin body

Making an Easy Job of Ordering Repair Parts From the Factory

(*Continued from page 12*)

These stock cards supply the stock manager with just what he has and what is on the way from the factory. As each article is sold, the proper entry, including balance, is made on the card, which is filed numerically.

Where cash sales of parts in stock are made to customers, they are recorded in triplicate on a manifolding machine, a slip being used headed "Parts Department." At the bottom of the white second copy, which is the customer's receipt, is the notice: "Parts Not Returnable After One Month From Date." One copy is filed in the office and the third copy is sent to the cashier.

On a smaller manifolding machine are recorded on pink slips charge repair transactions between the customer and the stockroom. These pink slips are in duplicate, following in miniature the slips as used in cash transactions, giving name, or description of article sold, date, price and, in addition, repair order number. Entries from the office copy of the pink slip are made on the back of the foreman's copy of the Repair Order Form, which is headed "Charge Sheet," as are the entries from stockroom and "outside" requisitions, and the mechanics' time cards. The Repair Order number and the form serial number appear in these cases. This foreman's copy—the duplicate of the Repair Order—is yellow. It is filed alphabetically under the customer's name.

Repair Order in Triplicate

Repair Orders are made out in triplicate. They consist of a white, or office copy, whose reverse side is the Cost Sheet, in which material and labor costs, including "outside" work, are tabulated from the requisitions, time cards, etc., as in the case of the "Charge Sheet" on the back of the foreman's copy. It is filed numerically in the office.

The third copy is stiff manila cardboard and is for the shop, to be attached to the car, or job, when slipped into a leatherette case with transparent celluloid front. This copy, like the others, contains complete instructions, when job is promised for delivery and to whom it is to be delivered. This is known as the Instruction Card. This triplicate form is eight in. by nine and one-half.

Work Checked as Finished

On his Instruction Card the mechanic checks off each item of work as he finishes it.

In a clip on the wall of the stockroom hang a number of unprinted and unruled sheets of paper, used by the stockroom manager for jotting down hastily in long hand for his own convenience his "inventory of jobs" for the mechanics. This idea never has been made up into forms. The sheets are filled out with such data as Repair Order number, name of customer and how far job has progressed. The items are crossed off in pencil as the jobs are finished. This plan has prevented considerable confusion and going through records to see how a certain job is getting along and whose truck is involved.

No truck is permitted to be taken from the shop after repair without a Car Release, a white card five by three in., marked "Deliver to Bearer," and giving date, model, car number and Repair Order number. It is signed for by the customer as being in good condition with complete equipment.

When wrong, or defective parts are to be sent back to the factory, a manilla tag, four by ten in. is used. This tag has a six in. stub as a Claim Tag, or Memorandum of Goods Returned for Credit, while the tag part proper, with brass-rimmed perforation, is attached to the part to be returned. If there is any credit, reference is made to the claim by invoice number.

A Bonus System for Mechanics

(*Continued from page 13*)

shop is the entire schedule, to which the mechanic, if he does not know how much time he is to be allowed on the particular job, may refer for information. He punches a timeclock when he starts on the job and again when he finishes. The clock records the actual time consumed.

However, whatever the job may be, the mechanic is paid a uniform rate of 50 cents per hour for the estimated time it will take him to do the work according to the posted schedule. It works in this way:

Take job IR, for instance: Installing engine in frame. The schedule says this should be done in 2 hr. 30 min., or, that much time is allowed the mechanic for doing that particular job and he is paid 50 cents an hour, or a total of $1.50 for doing the work.

If he is able to accomplish the work in 2 hr. instead of the scheduled 2 hr. and 30 min. he is paid the full $1.50 just as though he had taken the full time. If, on the contrary, he wastes time and consumes 3 hr. doing the work, he still is paid the $1.50 as the maximum and loses ½ hr. of his own time.

So, for any and all jobs which come into the Swaney shops, the time schedule has been carefully worked out and is conservative, yet liberal. Any good mechanic can perform the designated work in the times allowed, and most can do it in less. This puts a spur on endeavor and efficiency and there is keen rivalry among the men to see who will make the biggest bonus. The effect is at once apparent upon entering a Swaney shop—none of the men has time to do anything but to devote his closest attention to the work in hand.

According to the number and character of the jobs which come in, and according to the individual ability of the men, the bonuses earned vary all the way from a small amount to $15 and $20 a week. The chance to earn a bonus has set every man in the Swaney shops to thinking how he can cut out false motions and make every move count. The result is maximum efficiency.

To insure efficiency and to prevent slacking every man must guarantee the work he does. If it develops that he has slacked his work, made mistakes or done a poor job, he is compelled to do it over again and do it right on his own time and expense. In this case he received no pay for the work done the second time.

Shall We Divide Service

(*Continued from page 9*)

around this by partitioning off a part of their building and cutting through a door which leads to the other departments.

There are so many combinations possible in the automotive industry that no hard and fast rules can be laid down it seems, as to how the dealer shall handle his service. The matter, of course, becomes relatively simple where a dealer handles but one make and perhaps a truck, but when he has two or three makes of cars, one or more trucks and perhaps a tractor, with the necessary implements the problem becomes very complex.

So, if you are contemplating a new building, better make sure as to whether or not you are going to handle trucks and tractors in the future. Too often we hear dealers complain of the small size of their buildings, wishing that they had built a larger service station, so they could take on the agency for a truck. At any rate if you build, make sure that a few more stories can be added later on. The automotive dealer is coming into his own and it rather looks as though one building for sales and service on everything he handles is going to be the thing.

Tractors in Rice Fields

(*Continued from page 15*)

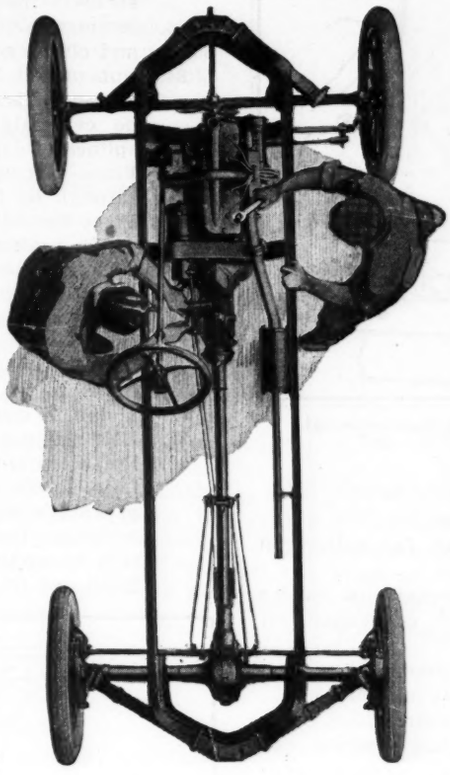
ping in the rice field, and at the same time present holding surface sufficient to keep the wheels from sinking deep in the mud.

The accompanying illustrations taken in the rice fields of Beaumont, Texas, show the Hart-Parr 30 tractor without extension rims and equipped only with the Hart-Parr Holdfast lugs, successfully pulling three 14-in. plows. Note the flooded, sticky condition of the field. The lug, however, kept itself clean due to the curve and the angle at which it is bent.

The Hart-Parr Co. has worked in the rice fields with all sizes of tractors, but it is their experience that a light, sturdy tractor, with surplus power for all emergencies gives the most satisfactory results to the rice farmer owner.

SERVICING THE OVERLAND FOUR

THIS is the fifth of a series of articles dealing with the service operations on the Overland Four. The work as it stands has been prepared by the Willys-Overland Co., and the dealer will find at the head of each operation the amount of time required to do the job. The operations have been put down in a step-by-step method so that one operation is logically followed by the next. This makes it possible for the service man to have on hand all the necessary tools and equipment before beginning the job. Incidentally the time limit set for the job affords a ready means whereby the skill of the mechanic ca be judged. Other things being equal it should not take a man longer to do a certain job than herewith mentioned, as the service department of the factory has established these limits after much experimenting. Dealers who are not keeping copies of MOTOR AGE on file are suggested to do so to get the benefit of this series.



PART V—The Engine

THESE valuable articles—Servicing the Overland Four—will run serially each week until the service operations on the entire car have been explained. This week deals with the

Engine

Next week will be a continuation of the service operations on the engine.

Keep a file of MOTOR AGE for ready reference. The flat-rate system of estimating on a job has been proved the best plan to make your service work more profitable, eliminate complaints and please your customers. The time given here for each service operation can be adapted to the flat-rate system of estimating cost of repair jobs on cars of this class.

TO REMOVE AND REPLACE CRANKSHAFT Time: 18 hrs.

1. Remove hood.
2. Drain radiator.
3. Remove front splasher by removing one 5/16-in., two 3/8-in. cap screws, and two 1/4-in. stove bolts.
4. Disconnect battery cable at battery terminal. Disconnect wires from lamp sockets and pull wires through shroud and radiator shell.
5. Remove radiator shell.
6. Remove 5/16-in. nut on radiator stay rod and pull rod out of radiator bracket.
7. Remove 5/16-in. bolts, with nuts and lock washers from starting crankshaft bracket fastened to radiator.
8. Remove 3/8-in. radiator holding down bolts with flat steel washers.
9. Remove one 5/16-in. cap screw with lock washer from lamp stay-rod.
10. Loosen clamps on radiator hose.
11. Remove radiator.
12. Remove clamp bolts and lift out clutch and brake pedal pads.
13. Disconnect speedometer cable at speedometer head.
14. Unscrew accelerator button and disconnect accelerator spring.
15. Remove floor boards.
16. Disconnect brakerod from brake foot pedal by removing cotter and clevis pin.
17. Remove clamp bolt clamping clutch pedal to clutch operating shaft; remove clutch and key from shaft.
18. Remove brake pedal.
19. Disconnect hand brakerod from hand brake lever by removing wing nut from rod.
20. Remove four 5/16-in. nuts holding gearshift box to transmission.
21. Remove gearshift box.
22. Remove spark control wire from distributer.
23. Remove carbureter choke wire from carbureter.
24. Remove carbureter choke wire from carbureter. Shut off gasoline supply fom carbureter.
25. Remove gasoline tank to carbureter gasoline line.
26. Remove starting motor cable from starting motor.
27. Remove two clamp bolts from coupling connecting steering column to steering gear horn wire.
28. Disconnect horn wire.
29. Pull steering gear column up out of the way.
30. Remove two cap screws holding muffler pipe to exhaust manifold.
31. Disconnect wires from ignition coil.
32. Loosen two clamp screws and remove ignition coil.
33. Disconnect primary ignition wire from distributer.
34. Remove nuts and lock washers from engine holding down bolts.
35. Drive engine holding down bolts out of frame hangers.
36. Remove generator wire.
37. Put chain sling around engine as in Fig. 9.
38. With crane or chain falls, carefully remove engine from frame. Place engine on suitable bench or in engine stand.
39. Unscrew cap screws, holding starting motor to engine base.
40. Withdraw starting motor until hand can be inserted to reach starting motor pinion.
41. Rotate pinion until counter weight is on top.
42. Remove starting motor as in Fig. 7.
43. Drain oil from engine through plug in bottom of oil base.
44. Drain oil from transmission through plug in bottom of transmission case.
45. Unscrew all cap screws holding transmission case to engine base.
46. Remove transmission.
47. Remove sixteen cap screws holding oil base to engine base.
48. Release clutch by placing two hardwood blocks, 1½ in. thick, 4 in. long, between clutch thrust bearing and clutch plate, as in Fig. 10.
49. Remove eight 5/16-in. cap screws from clutch coverplate.
50. Remove clutch coverplate.

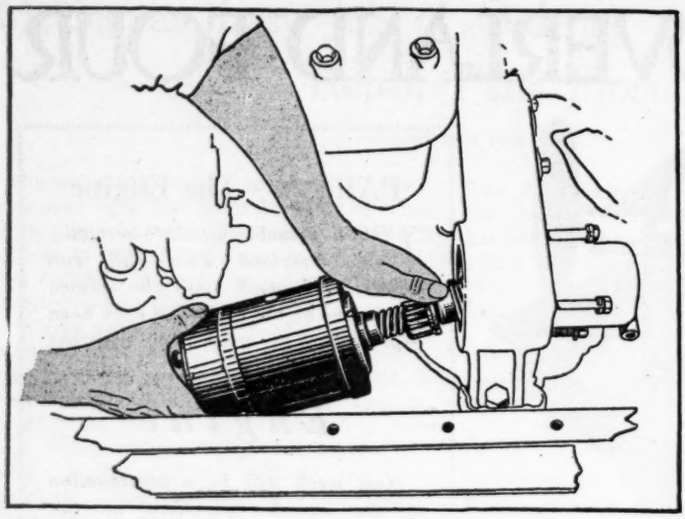


Fig. 7—Removing starting motor, showing counterweight at top

51. Remove clutch driving discs.
52. Remove three driving plate dowel pins.
53. With drift-punch, drive out crankshaft fan pulley pin and remove fan pulley.
54. Remove cap screws from engine gearcase and remove gearcase. With screwdriver, pry off crankshaft oil thrower.
55. Screw in one generator bolt to hold generator in position.
56. With gear puller, remove crankshaft gear.
57. Remove cotterpins from front auxiliary bearing cap and remove nuts.
58. Remove auxiliary bearing cap.
59. Remove cotterpins from all main and connecting rod bearing stud nuts.
60. Remove all bearing stud nuts.
61. Remove main bearing caps. Care should be taken to keep bearing liners in original position. Remove connecting rod caps from crankshafts and assemble caps to connecting rods, care being taken to see that shims are not disturbed from original position. These caps should be held to the connecting rod with rod stud nuts.
62. Lift out crankshaft and flywheel assembly.
63. Remove cotterpins from flywheel bolts and remove nuts and flywheel bolts.
64. Remove flywheel.
65. Remove piston assemblies from engine block.
66. Fit crankshaft to main bearings, using Prussian Blue for marking purposes. Unless you are thoroughly familiar with all details covering the proper fitting of crank and connecting rod bearings, this work should be turned over to a first-class bearing mechanic. See operations, 96 to 101 inclusive.
67. After crankshaft bearing has been properly fitted, remove crankshaft and install piston assemblies with marks on connecting rod bearing caps toward the camshaft and install crankshaft.
68. Fit connecting rod bearings to crankshaft.
69. When all bearings are properly fitted, replace all stud nuts and cotterpins.
70. Install front auxiliary cap, nuts and cotterpins.
71. Put in crankshaft Woodruff key.
72. Put on crankshaft gear with gear marks registering.
73. Put on crankshaft oil thrower.
74. Assemble flywheel to crankshaft, making sure that flywheel bolt holes register with each other.
75. With four bolts, bolt flywheel securely to crankshaft flange.
76. Cotterpin.
77. Put in clutch shaft annular bearing.
78. Put in molded asbestos disk.
79. Put in driven disk.
80. Put in molded asbestos disk and assemble clutch dowel pins in flywheel.
81. Assemble clutch pressure plate on dowels.
82. Put on clutch cover, fastening with eight cap screws. All holes of clutch cover must line up with holes in flywheel, leaving blocks in place until cover is securely fastened to flywheel.
83. Remove blocks from between clutch thrust bearing and clutch cover.
84. Put on oil base, fastening with sixteen $\frac{5}{16}$ in. cap screws. The hub of the driven disk in the clutch must be centrally lined so that clutch shaft will enter splines of driven disk.
85. Place transmission in position, pushing clutch shaft through as far as possible.
86. Place key in clutch operating shaft and put on clutch pedal, prying forward, which will pull the transmission into place through pressure of clutch fork against thrust bearing.
87. Bolt transmission securely to engine base.
88. Install starting motor, making sure that the counter balance weight is at the top, so that weight will not interfere with flywheel when installation of starting motor is made.
89. Bolt starting motor securely to engine base.
90. Put chain sling around engine and with crane or chain falls, lower engine into frame—one man at rear end of engine to steer torsion tube into universal joint housing. It may be necessary to pry engine into position by using piece of scantling or long board against front end of engine case and front axle.

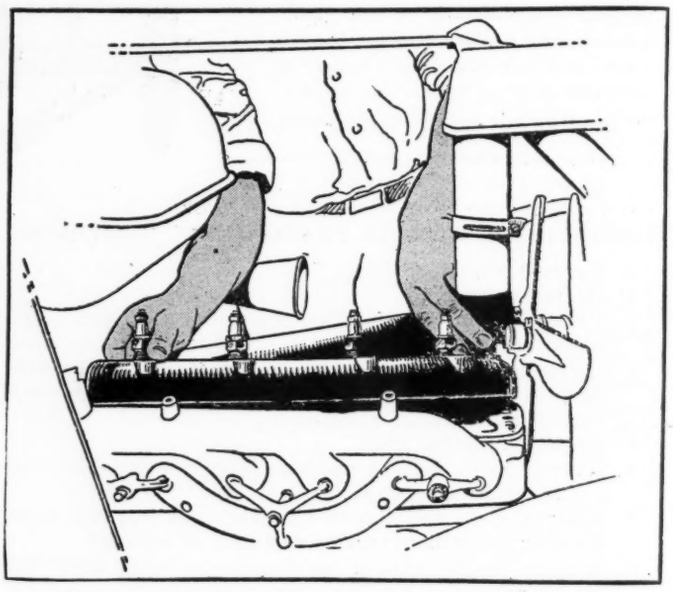


Fig. 8—Lifting off cylinder head

91. Line up engine in engine frame hangers with short pinch bar.
92. Insert right front engine holding-down bolt.
92. Insert right rear engine holding-down bolt. It may be necessary to use jack between frame sill and universal joint housing in order to insert right rear engine holding-down bolt.
94. Insert left rear engine holding-down bolt.
95. Insert left front engine holding-down bolt.
96. Two men put on side and front engine shields, engine holding-down bolts, lock washers and nuts. Fasten securely.
97. Place transmission sliding gears in neutral.
98. Place gearshift lever in neutral.
99. Put on gearshift housing assembly.
100. Put on four lock washers on gearshift housing studs.
101. Put on stud nuts and tighten.
102. Slip on brake pedal over clutch fork shaft.
103. Connect brake rod to brake pedal with clevis and cotterpins.
104. Put Woodruff key in clutch fork shaft.
105. Assemble clutch pedal and shaft and clamp securely with clamp bolt and nut.

106. Connect carbureter choke wire to carbureter.
107. Connect throttle control wire to carbureter.
108. Connect starting motor wire.
109. Put on gasoline tank to carbureter gasoline line.
110. Connect muffler tube to exhaust manifold with two cap screws, lock washers and nuts. Care must be taken to see that gasket is between exhaust manifold and muffler tube flanges.
111. Put on and clamp ignition coil in place.
112. Connect ignition wires to coil.
113. Connect primary ignition wire to distributer.
114. Connect spark control wire to distributer.
115. Check timing of engine. Remove No. 1 spark plug; then remove distributer cover. Crank engine until No. 1 cylinder is on compression stroke—this can be determined by holding hand over spark plug hole. Insert wire in spark plug hole and crank engine slowly by hand until piston reaches highest point of travel. Continue cranking slowly until top of piston is flush with cylinder block.
The piston in this position corresponds with point of firing mark on flywheel with spark control button in fully retarded position. The breaker point should start to break with distributer arm just coming in contact with No. 1 plug wire port in distributer cover, at this position of piston. If timing is off, release clamp screw holding distributer to generator and set timing by remeshing distributer driving gears.
116. Put on fan belt.
117. Put on radiator, lock washers and nuts, and tighten securely.
118. Assemble radiator hose and clamp tightly.
119. Put on starting crankshaft and bracket assembly. Bolt to radiator with two $\frac{5}{16}$ in. bolts, lock washers and nuts.
120. String front lamp wires through holes in fan shroud on radiator.
121. Put on radiator shell, lacing headlight wire through hole in radiator shell.
122. Slip front splasher under radiator shell and line up holes on shell and splasher. Fasten assembly to

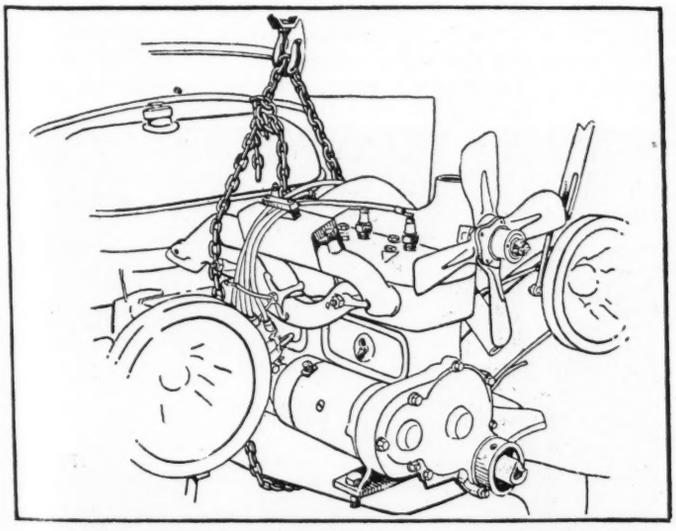


Fig. 9—Showing how chain should be slung around engine for removal

frame with one $\frac{5}{16}$ in. cap screw, two $\frac{3}{8}$ in. cap screws, and two $\frac{1}{4}$ in. stove bolts and nuts, using flat washers under screw heads.
123. Put on front lamp stay-bar.
124. Connect front lamp wire to lamp sockets and connect lamps. Also connect battery cable to battery.

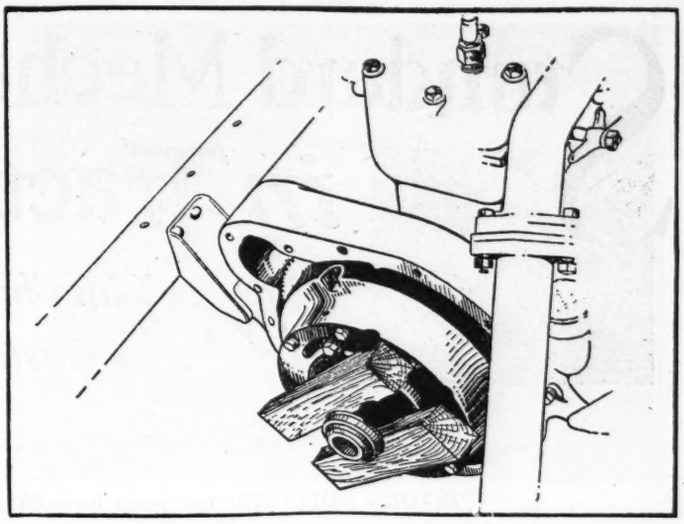


Fig. 10—Proper manner to block out clutch

125. Put on radiator stay-rod.
126. Fill radiator with water.
127. Put one gallon oil in engine base, through engine breather tube.
128. Connect up speedometer cable.
129. Put in floor boards with four cap screws.
130. Put on pedal pads, clamping with clamp bolts.
131. Connect accelerator spring and screw on accelerator button.
132. Tune up engine.
133. Put on hood.

TO TAKE UP CRANKSHAFT MAIN BEARINGS

Time: 3 hrs.

1. Remove engine shields by removing engine anchor bolt, nuts and lock washer.
2. Drain oil base by removing plug at bottom of base.
3. Unscrew all cap screws holding engine oil base to the transmission housing.
4. Remove all cap screws holding base to engine.
5. Remove oil base.
6. Remove three cap screws holding auxiliary cap to engine gearcase.
Remove cotterpins and nuts and remove auxiliary cap.
7. Remove cotterpins from all main bearing caps.
8. Remove nuts from rear bearing cap, and remove cap.
9. Take shims of equal thickness from each bearing cap stud.
10. Put on cap and cap stud nuts. Tighten securely.
11. Continue removing shims until a perceptible drag is felt on crankshaft when the crankshaft is turned over. Loosen cap nuts slightly.
12. Tighten center and front main bearings in the same manner.
13. After bearings are properly fitted, tighten all bearing cap nuts securely and cotterpin.
14. Cotterpin stud nuts.
15. Place front auxiliary cap in position and tighten with nuts. Cotterpin. Put in three cap screws through engine gearcase.
16. Replace oil base with sixteen $\frac{5}{16}$ in. cap screws, and seven $\frac{3}{8}$ in. cap screws, with lock washers under head.
17. Put on engine shields with engine holding down lock washers and nuts. Tighten securely.
18. Replace crankcase drain plug and fill with one gallon of good engine oil.

Standard Mechanical Operations in Tractor Service

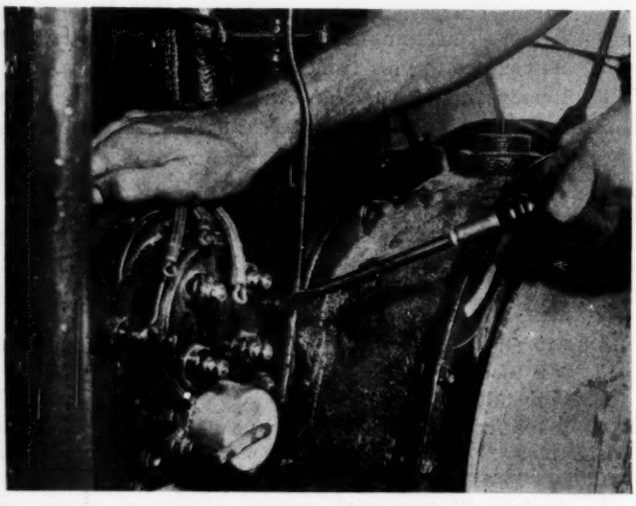
by John Charles Thorpe, M.E.
and Gustav Howard Radebaugh

EDITOR'S NOTE: The two pages herewith are the seventh of a series covering the service operations on tractors, although the same can be applied quite generally to passenger car and truck engines. In last week's issue of MOTOR AGE we told of the operations necessary to correct the troubles caused by dirty collector ring and brush. This installment deals with the engine firing intermittently, or will not start, caused by dirty contact points in the distributer and how to locate and clean them. It is often the case that the more simple a trouble may be the more difficult it is to locate. It is with this in view that we present this series which deals with the everyday problems that may confront the tractor owner and tell here how to locate and remedy these troubles.

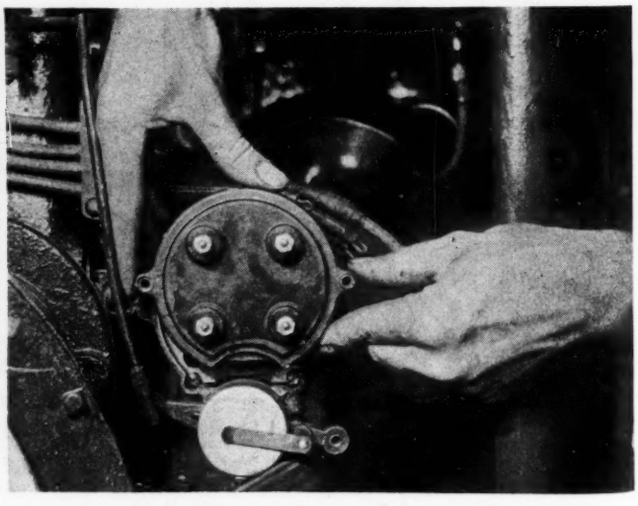
PART VII

Dirty Contact Points in Distributer

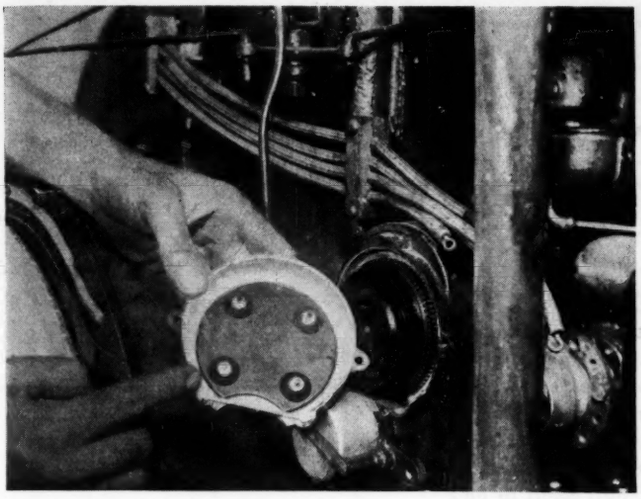
The secondary or high tension ignition current generated in the magneto is carried from the secondary winding to a contact plate on a revolving disk,—in some forms of magnetos called a rotor. It then becomes necessary to provide a means for transmitting the current at proper times to the ignition cables carrying the current to the spark plugs. The cover plate for the revolving disk or rotor is fitted with binding posts for the ignition cables on the outside that carry contact points on the inside constructed of a convenient form for making sliding contact with the rotating disk or rotor. The number of binding posts corresponds to the number of cylinders. The auxiliary rotor shaft is driven by suitable gears from the magneto shaft. This mechanism is known as the distributer and it will be readily seen that as the rotating segment, or contact plate comes in contact with the contact points of the cover plate, the current will flow through to the binding posts, and thence through the



1. Disconnect ignition cables and remove screws or fastenings of distributer cover. The fastenings are usually made with small screws or studs with small knurled binding nuts. Care should be exercised to see that the small parts are not misplaced during the succeeding operations



2. Remove distributer cap or cover carefully, so as not to injure mechanism. In some instances the "slip" joint between the cover and the frame is so snug that it may be badly damaged by rough handling. The rubber composition is quite brittle and will crack if rapped smartly with a hand tool

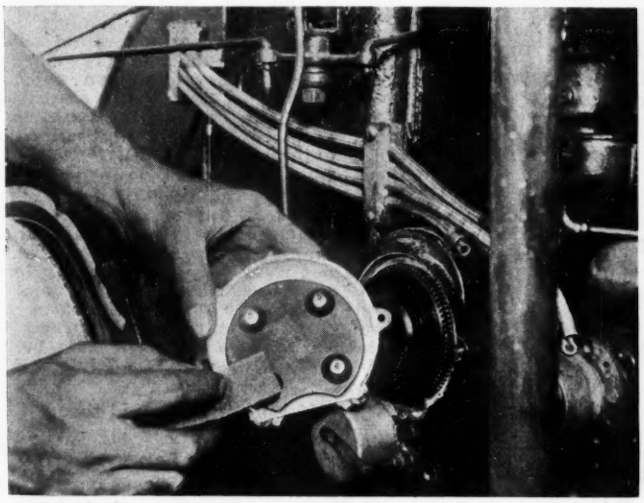


3. Observe dirty contact points. This condition is due to dirt that works through the joint. Mixing with the small amount of oil in the distributer, it forms a coating or gum over the points that prevents the flow of ignition current

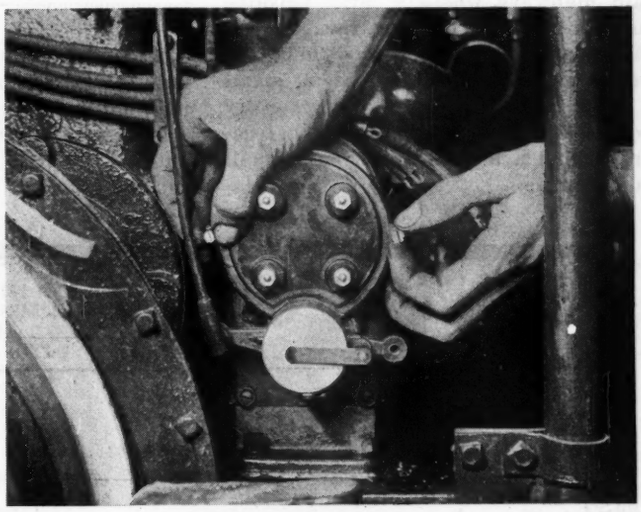
5. Observe rotor and other internal mechanism of distributer. It will be seen that as the distributer disk rotates the segment makes a wiping contact with the contact points. The current flows through these points to the spark plugs through the ignition cables during the short period that the contact is maintained

ignition cables to the spark plugs. As has been explained, the ignition current is grounded to the engine block through the body of the spark plugs. There is also a ground connection from the secondary winding of the magneto. Thus the circuit is completed when the contact plate of the rotating disk or the rotor is in contact with the contact points of the distributer. Proper operation of the engine is obtained by connecting the ignition cables from the distributer to the proper spark plugs to agree with the correct firing order, which is usually in sequence, 1-3-4-2.

As has been suggested in the discussion of the collector ring and brush, regardless of precautions taken, particles of oil, dirt and grit sift through the cover plates of the magneto and interfere with proper operation. This is sometimes the case with the distributer. The trouble is indicated by the intermittent firing of the engine or extreme difficulty in starting.



4. Clean points with piece of fine emery cloth. This procedure should be continued only to the point of polishing the points



6. Carefully replace distributer cap in proper position and make fastening snug but be careful not to use enough force to injure

Next Week—Firing Points of Breaker or Interrupter

YOU see in pictures on these two pages mechanical operations often referred to in discussions of locating engine troubles. You have been told to do this or that, but have not been shown how in a manner that would make it instantly clear.

By following this series you will have unfolded before you a motion-picture method of performing service operations on tractors, trucks, motor car or any automotive products.

Next week we shall describe the troubles in the breaker or interrupter caused by dirty or corroded firing points.

Garage Planning
Service Station Arrangements

No. 197

COMPLETE PLANT FOR SMALL TOWN

We are enclosing a somewhat discriptive outline of a building that we are to build in the spring and would greatly appreciate your judgment and suggestions in the planning of the different departments that will be installed in the

I have heard many suggestions in regard to a cutaway corner and have my gas and oil convenient to the public but I feel that I will be losing valuable space that could be used very advantageously as a display for new cars and accessories. I would greatly appreciate your opinion in this matter.

We hope to have a modern and strictly up-to-date country garage. The population of this city is about 1500 and is the county seat, territory very good.—Universal Garage, Burns, Ore.

Your argument in respect to the corner filling station quite concur with our own in that this is the most valuable space in your building and should be pressed into the greatest service, that of selling cars. If you were not selling cars and had a corner at the juncture of two main highways where a large gasoline business could be built up then the gasoline station might be a good thing, but even under these conditions a small 16 by 20 ft. building would answer every requirement, why place a 100 ft. structure behind a business with such small requirements.

MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquiries are urged in asking for such plans to be used to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

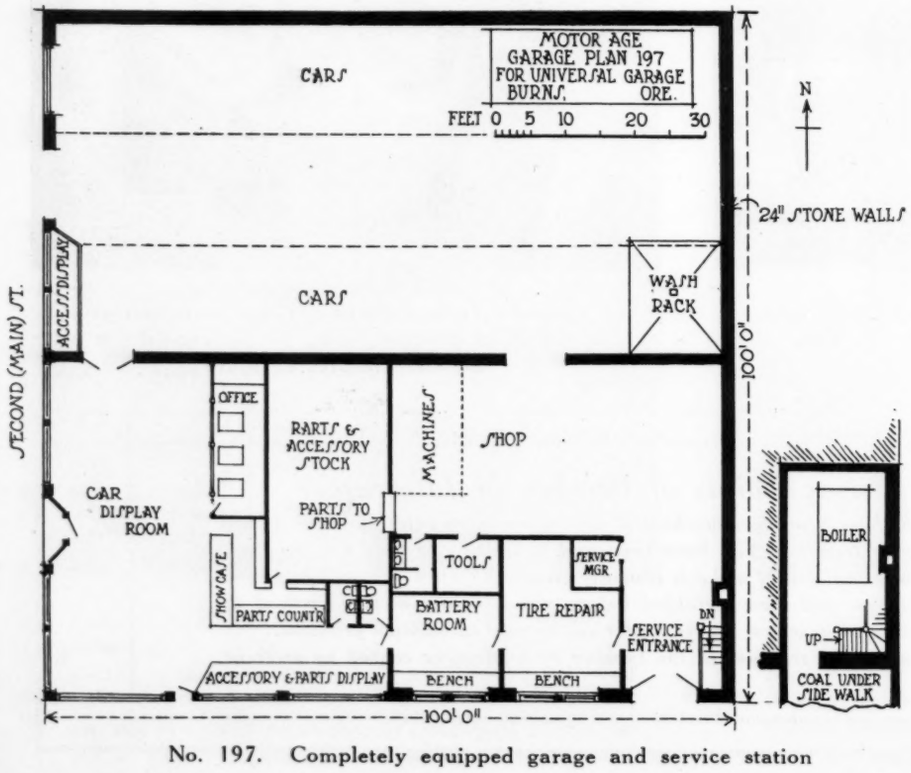
Number of cars on the sales floor.

Number of cars it is expected to garage.

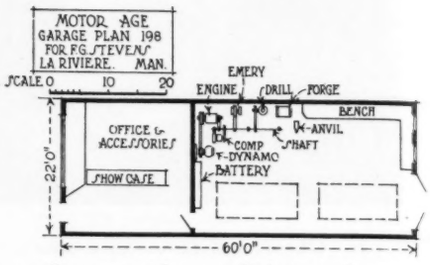
Number of men employed in repair shop.

And how much of an accessory department is anticipated.

We judge from your layout that you wish to keep the north half of your building entirely free for storage. This crowds considerable into the south half, but the layout is pretty good everything considered.



No. 197. Completely equipped garage and service station



Garage with own lighting plant

No. 198

SMALL SHOP WITH LIGHTING PLANT

Please give best layout for garage for small town, cars mostly Fords and other small cars. We have a frame building, 22 ft. by 60 ft. on a lot 25 ft. frontage by 100 ft. depth lane at back.

We wish to partition off workshop for two cars, containing gas engine and air compressor and small generator for lights, work bench. Post drill, emery wheel and small portable forge and anvil. We are installing gasoline pump in front of building and will handle oil, grease, etc.

What size of generator would suit us for lighting and some battery charging? We figure to light our own shop and possibly one or two small stores near here. We have one 3½ hp. gasoline engine for power and would have to run air compressor occasionally.

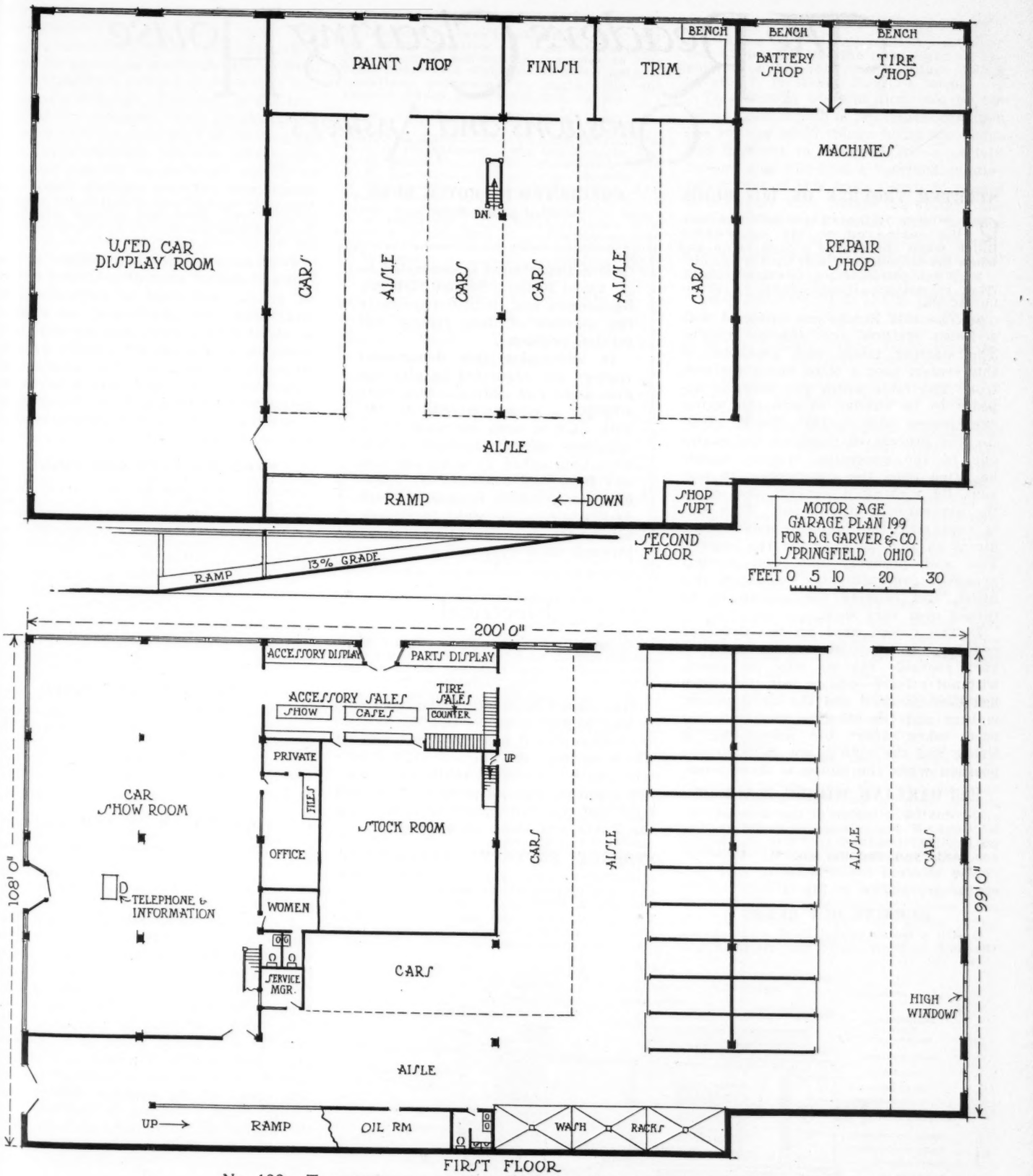
We were figuring to run compressor from engine pulley and generator from flywheel direct (opposite side). Please give details of charging apparatus and also storage battery capacity needed. We would not want to run engine any longer than necessary. The engine runs 475 r.p.m. and has 20 in. flywheel—3-in. face. Would the ordinary auto storage batteries be suitable or glass cells be better?—Fred G. Stevens, La Riviere, Man., Canada.

Your 3½ hp. engine would theoretically carry 2600 watts or 52-50 watt lamps but figuring the belt, generator, transmission and battery losses you will do well if you recover enough to carry 40 lamps. You will need a 3 kw. generator and you had better use 110 volt current and drive the lights direct from the generator as the battery necessary would cost a great deal unless you use 32-volt current and then the cost of your wiring would mount enough to offset the reduction in cost of battery.

If you light two stores beside your own store and shop you will pretty nearly need the maximum capacity of your engine and you would gain nothing by driving through a battery.

Most of these generators are designed to run 1000 r.p.m., which would call for a pulley 9½ in. if driven from your 20-in. flywheel.

The glass jar batteries are better for this work being built for it.



No. 199. Two-story garage with individual stalls for the storage of cars

No. 199

GARAGE WITH INDIVIDUAL STALLS

We are contemplating the erection of a two-story garage close to the center of this city, and we would like to have you submit some plans for this garage. We have 108 ft. fronting on one of the principal streets and it is our intention to have a showroom the entire width of the garage with the exception of the drive, and running back approximately 50 ft., and it is to be carried for the full two stories. The plot of ground runs back 200 ft. to another street and at the corner of this other street, we have a lot 50 by 99 ft., which joins with the other property. We are enclosing a diagram showing the location of the property and the approximate elevation. We intend to use a ramp to get to the second floor. Any information you can give us will be very greatly appreciated.—B. G. Garver & Co., Springfield, O.

We have followed your suggestions as well as we could considering the limited amount of information you gave us. Your idea of individual stalls is a good one if you can rent them for enough to pay for the extra cost and space they take. We haven't installed them in all the storage space but used about half of the main floor space reserving the remainder for the ordinary open kind. The stalls have been made about as small as possible and it might be well to widen them a foot or more if it would pay.

The Readers' Clearing House

Questions and Answers

CONDUCTED BY ROY E. BERG
Technical Editor, Motor Age

THIS Department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repairs and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by some one else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

STARTER TROUBLE ON 1918 BUICK

Q—Why is it the starter will not turn the engine on a 1916 six-cylinder Buick when the engine switch is on and when the switch is off will turn it rapidly?

2—What prevents an Overland clutch from releasing?—Joseph Yaho, E. Pittsburgh, Pa.

1—The 1918 Buicks are equipped with a Delco ignition and lighting system. The starting motor and generator of this system uses a third brush for control. The fault which you describe appears to be similar to one the writer experienced with a 1917 Buick. During the process of cranking the engine one of the generator brushes should be lifted from the commutator to prevent its making a contact that gives the generator a direct load. This load is supplying the ignition and lighting direct as well as charging the battery. You will probably find that gummy grease is preventing the release of this brush and causing the engine to be turned over very slow.

2—The clutch used on the Overland car is a cone clutch. There are two very probable reasons why the clutch will not release—one is that the clutch has been jammed and the shifting fork is bent and the other is that if it has been taken apart the assembling is wrong and the cone is not in its proper position when the clutch is thrown out.

1913 OAKLAND WIRING DIAGRAM

Q—Publish diagram of the internal connections of the Deaco generator as used on the 1913 Oakland 35.—Wm. C. Hutchison, Auto Inn, Sedalia, Mo.

The internal connections of this generator are shown in Fig. 1.

BURNING OUT BULBS

Q—On a Buick model D-45 what causes the bulb to burn out in the left headlight while car is running? Even when a high candle-power bulb is used it won't last more than 30 min. Dimmer bulbs do the same.—R. E. Bours, Zanesville, Ohio.

Electrical

This cannot be caused by faulty wiring or any trouble with the lighting system. We believe that it is a result of vibration which destroys the filament after a certain length of time. Examine your headlights and see that all parts are tight and rigid and you will undoubtedly find that the lights will stand up all right.

STORAGE BATTERY ELECTROLYTE

Q—The turning over of a Gould battery caused a portion of the solution to escape through a vent plug. The battery was filled with water and put on charge, but the cell registers only 1150 while the other two reach the 1300 mark. The battery is new and does not leak. How can the cell be made to register its proper amount and what sort of acid should I use, and how much?—O. W. Lloyd, Saxton, Pa.

1—Draw out some of the water in the cell and add an electrolite of 1300 specific gravity composed of sulphuric acid and water. Put the battery on charge at about 3 or 4 amp., and see if it will come up to the correct specific gravity when fully charged. The amount of electrolyte to be used will have to be determined by trial and for that reason it is advisable to go to a battery service station if convenient.

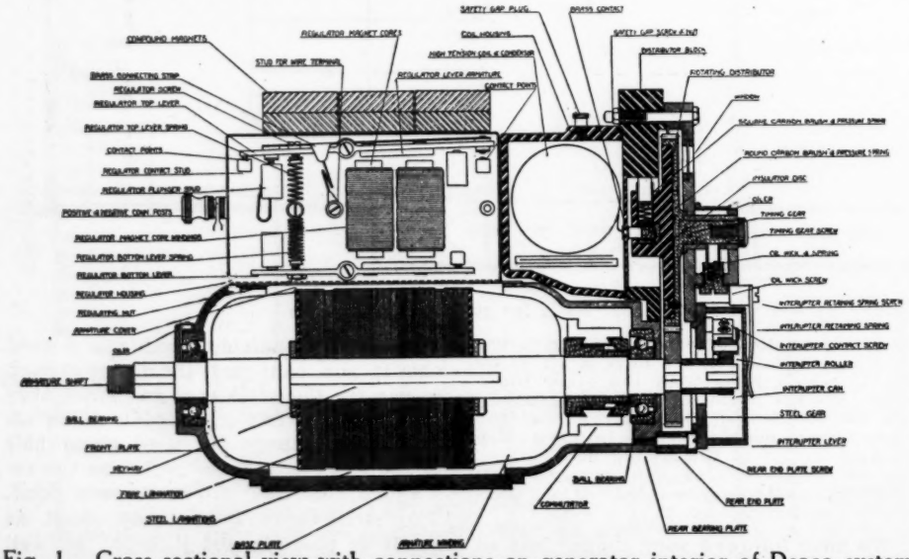


Fig. 1. Cross sectional view with connections on generator interior of Deaco system as used on 1913 Oakland 35

FORD MAGNETO AND COILS

Q—Illustrate how to connect an Auto-Lite generator to run the engine on an Overland 85 without a storage battery.

2—Show correct arrangement and distance of a Ford magneto and coils.—J. McGlenning, Fishburn, Atla.

1—It is not possible to connect the generator so as to supply current for the ignition system without the use of a battery. Arrangement of Ford magneto and coils is shown in Fig. 2.

2—This clearance should be $\frac{1}{16}$ in.

CONNECTIONS ON LOZIER

Q—Publish wiring diagram of the four-cylinder Lozier 84.—Frank Jaeger, Freeport, Ill.

Diagram of the Gray and Davis system on the 4-cylinder Lozier 84 is shown in Fig. 9.

IGNITION SYSTEM ON NEW REO SIX

Q—Explain the ignition system on the new Reo Six.

2—Can the new Reo Six be run without the battery?—Lewis K. Foster, Republic, Kans.

1—The ignition system of the 1920 Reo Six is a battery with distributer. The current passes from the battery through the ammeter to the ignition coil. From the coil it goes to the distributer and then to the spark plugs at timed intervals. The distributer is composed of a rotating arm which is driven at a definite speed so that it makes and breaks contact with stationary contact points. The speed of the rotating arm of the breaker with reference to the speed of the engine is 1-2 crankshaft speed.

2—The Reo Six cannot be run without the battery.

BOSCH DUPLEX IGNITION SYSTEM

Q—Instruct how to install a two-wire Bosch DU 2 model 5 2 Duplex magneto on a 2-cylinder 4-cycle engine?

2—Where should the battery wires be connected to this Duplex non-vibrating switch? Show where wires from magneto are connected to the duplex switch.

3—Close to the terminals it says M. 1 M. 2. What does this mean?—L. A. Hubacek, Random Lake, Wis.

1—The type DU 2 must be driven a half engine speed (camshaft speed) for

two cylinder four-cycle engines where the cylinders fire alternately every 360-degree revolution of the crankshaft. The magneto should be positively driven from the engine by a method of drive that will eliminate slippage. The next is the timing of the magneto. The crankshaft is rotated to bring the piston of No. 1 cylinder (in automobile practice this is the cylinder nearest the radiator) exactly on top dead center of the compression stroke, and the piston is to be maintained in that position. The magneto is then to be secured to its bracket or bed on the engine, and the timing control arm on the interrupter housing placed in the fully retarded position.

With that done, the magneto distributer plate should be removed by withdrawing the two holding-screws, or depressing the two catch springs, as the case may be, thus exposing the distributer gear and brush. The cover of the magneto interrupter housing is also to be removed to permit observation of the interrupter.

The armature should then be rotated by means of the exposed distributer gear in the directon in which it is to be driven until the platinum interrupter confacts are just about to separate, which occurs when the interrupter lever begins to bear against one of the steel segments of the interrupter housing.

The armature should be held in that position while the magneto is connected to the engine, due care being taken that the piston of No. 1 cylinder is still exactly on top dead center of the compression stroke. The installation is completed by replacing the interrupter housing cover and distributer plate, and connecting the cables between the magneto and spark plugs. With DU2 the dust cover over the armature should be removed to facilitate rotation of the armature by hand during the timing.

2—Wiring Diagram is shown in Fig. 3.

3—We have no record that shows what these terms might mean.

OPERATION OF GENERATOR ON 1920 FORD

Q—At what car speed should a generator begin to charge on a 1920 Ford?

2—When does it reach its maximum rate?—Jesse P. White, Jr., Lexington, Ala.

1—The outcome operates when the generator is turning at the rate of 600 r.p.m. or a car speed of 10 m.p.h. At this point the voltage is slightly above that of the battery and the generator should be charging.

2—The generator reaches its maximum charging rate which is about 10 amperes at a generator speed of 1200 r.p.m. or a car speed of 20 m.p.h.

STARTING A FORD WITH DRY CELLS

Q—When dry cells are used to start a Ford does it have a tendency to make the car harder to start? Is there any objections to using dry cells for starting?—Edward Stowe, Los Angeles.

There is no reason why dry cells should make the car harder to start, and as a matter of fact, the writer's experience has been that the car is easier to start with dry cells than with the magneto. There are no objections to using dry cells for starting.

TO assist readers in obtaining as a unit all information on a certain subject MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

ELECTRICAL

Joseph E. Yoho.....Pittsburgh, Pa.
Wm. C. Hutchinson, Auto Inn..Sedalia, Mo.
R. E. Bours.....Zanesville, Ohio.
O. W. Lloyd.....Saxton, Pa.
J. McGlenning.....Fishburn, Ala.
Frank Jueger.....Freeport, Ill.
Lewis K. Foster.....Republic, Kans.
L. A. Hubacek.....Random Lake, Wis.
Jesse P. White, Jr.....Lexington, Ala.
Edward Stowe.....Los Angeles, Calif.
T. R. Hayes.....Eckford, Mich.
Hurbert Ludwig.....Rockford, W. Va.
F. Martels, Standard Garage
.....Patchogue, N. Y.
Frank A. Pelican.....Hillhead, S. D.
B. D. Warren.....Hopkinsville, Ky.
H. J. Chadderton.....Farrel, Pa.
Gilbert L. Slack.....Huntington, W. Va.

ENGINES

Fred Gosenberg.....Solon, Ia.
Harold J. Paul.....Bisbee, Ariz.
Roscoe C. Morgan.....Corydon, Ia.
Adolph Grover.....Wimbledon, N. Dak.
Guyan Valley Garage.....Logan, W. Va.
Herbert Ludwig.....Rockford, W. Va.
H. H. J.....Ogden, Iowa.
Reeves P. Sykes.....Alliance, Ohio.
Harry P. Pesel.....Louisville, Ky.
A. L. Bye.....Cedar Rapids, Ia.
Frank A. Pelican.....Hillhead, S. D.
A. S. Hunter.....Durham, N. C.
J. Henry.....Seattle, Wash.
B. D. Warren.....Hopkinsville, Ky.
J. W. Owens, Bijou Motor Parlors
.....Lethbridge, Alberta, Can.
W. Bowden.....Brooklyn, N. Y.
H. L. Waltham.....Alliance, Ohio.
C. E. Dauwaulter, Dauwauter Garage
.....Carver, Minn.
Carl Shepherd.....Newark, Ohio.
Albert A. Heller.....Natrona, Pa.
T. P. Hayes.....Eckford, Mich.
W. S. Reamon.....Tipton, Mo.

REBUILDING

John C. Mahoney.....Poughkeepsie, N. Y.
Herbert Barber.....Ashland, Ky.
Ray B. Redmon.....Shoshone, Idaho
Eugene Hay.....Newhope, N. Y.
B. H. Britzke.....Sherill, N. Y.
James Grat.....Baltimore, Md.

MISCELLANEOUS

Harry F. Pesel.....Louisville, Ky.
L. Ballitto.....Chicago
Edward Stowe.....Los Angeles, Calif.
N. G. Cole.....Sacramento, Calif.
George A. Mason.....Worthington, Minn.
Cotton States Motor Car Co.....
.....Memphis, Tenn.
Harry J. deBock.....Cleveland
J. Lawrence Kizer, King Motor Car Agency.....South Bend, Ind.

MORE LIGHT

Q—On a farm-lighting plant, which of two bulbs will give the most light—a 32-volt or a 110-volt, other things being equal?—T. R. Hayes, Eckford, Mich.

The amount of light that can be obtained from a bulb is not dependent upon the voltage other things being the same. The filament is designed for a certain voltage and will give a specified candle-power but if this same lamp is placed in a circuit with double the voltage the filament will get hotter and produce more light. Result of doubling the voltage will be that the lamp will only last a very short time and then burn out.

REPLACING PLATINUM POINTS

Q—Explain method of placing platinum points, made from a bar of platinum, on a high-tension Dixie magneto.

2—Can one purchase such points ready for installing?

3—Explain manner of testing for a burnt-out armature.—Hurbert Ludwig, Rockford, W. Va.

1-2—The platinum points will have to be fitted to holders and then placed where the old ones have been removed. It is not advisable to make platinum points from bar stock, for points can be bought ready for use and it will only require a little time, the use of a screwdriver and a magneto wrench to do the job of replacing them.

3—The best method for testing armatures for shorts and burnouts is the fall of potential between commutator bars which can be determined in many ways. A very short and easy way was described in Jan. 1 issue of MOTOR AGE.

GENERATOR WILL NOT GENERATE

Q—Explain why a model T North East generator will not charge. Armature was refaced; the shunt field and series field are free from shorts. The tests, which were made with 110-volt circuit, 16 candle-power bulb, showed light from ends of fields, indicating no open circuit. When testing with four dry cells the shunt field winding gave a thud, as if trying to start engine.—F. Martels, Standard Garage, Patchogue, N. Y.

1—In the construction of some generators, the coils are soldered to the commutator by simply pouring solder into the slot which holds coil leads. The

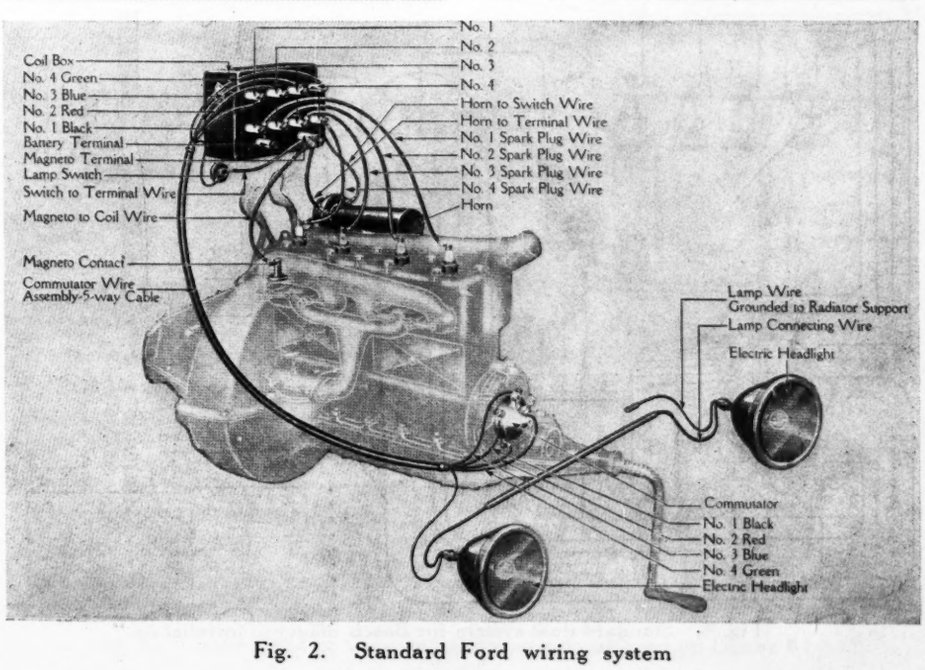


Fig. 2. Standard Ford wiring system

position of the coils is shown in Fig. 5. If the generator is running, the leads may separate and break contact with the result that the generator will not produce any current. When the generator is not running the coil ends will make contact and no fault will be detected. We believe that this is your trouble and we advise going over these connections thoroughly.

INSTALLATION OF BOSCH DUAL SYSTEM, CHARGING STORAGE BATTERIES

Q—How can one tell the amperage of a storage battery?

2—In charging a battery from an outside source, how should the positive and negative connections at battery be made?

3—What change should be made in these connections if positive or negative is grounded?

4—Instruct how to install a battery ignition system with circuit breaker on magneto, a high-tension coil and dual ignition switch on an Overland 83 fitted with a Bosch magneto.—Frank A. Pelican, Hillhead, S. D.

1—The amperage of a storage battery can be determined by installing an ammeter in the circuit as shown in Fig. 7.

2—In charging a battery from an external source the connections are made as shown in Fig. 6.

3—Regardless of whether the positive or negative is grounded the positive and negative lines coming from the external source should be clipped to the battery terminal in their respective order.

4—The wiring diagram of the Bosch dual system for a 4-cylinder engine is illustrated in Fig. 4. The connections are very simple and therefore need no additional explanation.

CORROSION OF BATTERY TERMINALS

Q—Explain why the Willys-Overland Co. runs the charge, light and ignition wires to the positive terminal of the battery instead of the positive side of the starting switch?

2—Why does the positive terminal of a storage battery corrode more than the negative?

3—The starter-generator on my Dodge made a whistling sound. I took it apart and found one brush grounded to the frame. The other brushes were all right. The armature showed no ground. When installed the whistling sound was gone, but it only showed a charge of 5 amperes, with an ammeter cut in the circuit at the generator.—B. D. Warren, Hopkinsville, Ky.

1—These wires could be run to the positive side of the starting switch as well as to the positive terminal of the battery. There is no reason for this except that it is probably more convenient to connect.

2—Corrosion of the plates of a battery involves the ionic theory which is complex and very hard to explain. The positive plate is composed of lead peroxide and the negative of sponge lead. When these plates are placed in a solution of dilute sulphuric acid there is a chemical reaction which forms a white substance known as lead sulphate. This substance forms on both plates, but according to the ionic theory which shows that when an electric current is present the ions flow in a certain direction, there is a greater deposit of lead sulphate on the positive plate. When this substance accumulates in great excess, it clogs the pours of the plates and prevents the circulation of the acid.

3—The trouble is probably due to poor commutation. Examine the commutator and see that it is thoroughly cleaned. In replacing the brush it may have stuck in a position which prevents it from making good contact with the commutator. The brush should work freely and the brush spring should be of sufficient strength to give the proper amount of pressure to the brush.

WIRING DIAGRAM ON CHALMERS

Q—Publish wiring diagram of a 4 passenger six-cylinder Chalmers car, model 29, including starting system.—H. J. Chadderton, Farrel, Pa.

The Entz system as used on the 1915 Chalmers 29 is shown in Fig. 8.

GENERATOR TROUBLE

Q—Explain why the Gray and Davis generator on a 1914 or 1915 Michigan, Model H, does not generate; Atwater-Kent ignition is used. I have had the car overhauled, a new ammeter installed, and the wiring changed.

2—Publish wiring diagram showing how the trouble can be remedied.

3—Where is the Michigan factory located?—Gilbert L. Slack, Huntington, W. Va.

1—There are a great many causes for this trouble and a careful test will have to be made. Be sure that the contact points of cutout actually make contact, for the solenoid may pull up the armature without the contact points coming together. If after this the ammeter does not indicate current, push up armature at bottom of cutout so contact is made, then if no current is generated, there is an open circuit between battery and generator. If the ammeter indicates current in the opposite direction, that is discharge, it shows a loose or broken shunt field connection. To determine whether generator is all right, disconnect it from the engine, close contact at points at cutout by pushing up armature. The generator will then run as a motor and take about 2 or 3 amp. In addition to these tests be sure the commutator is clean and the brushes are all right.

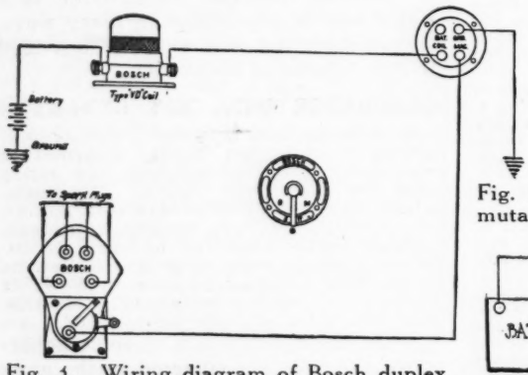


Fig. 3. Wiring diagram of Bosch duplex ignition system

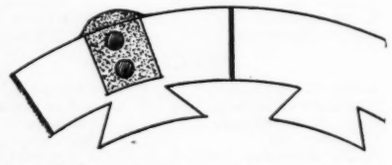


Fig. 5. Enlarged cross section of commutator bar showing method of fa tening

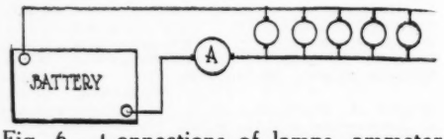


Fig. 6. Connections of lamps, ammeter and battery for charging

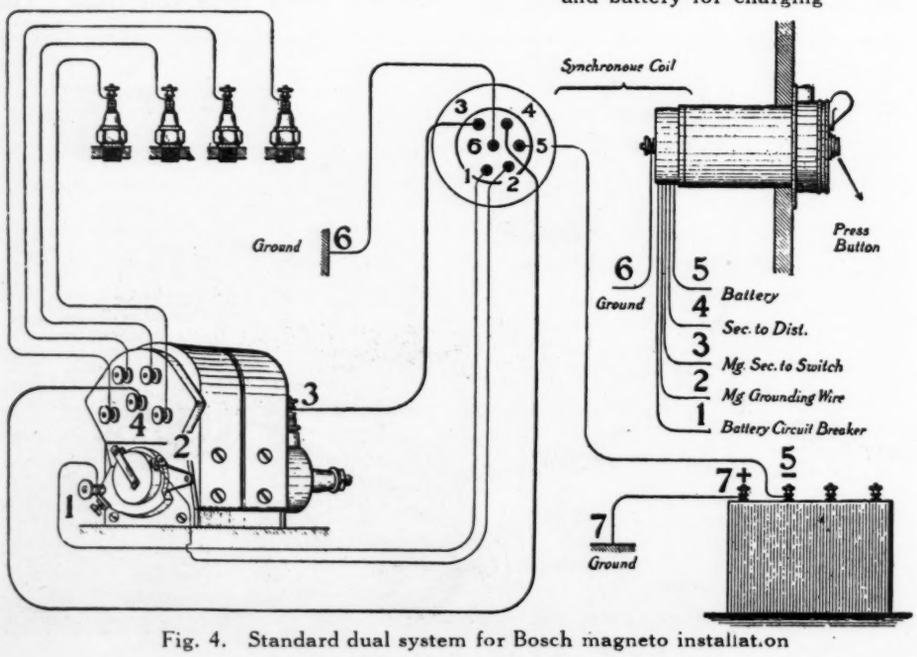


Fig. 4. Standard dual system for Bosch magneto installation

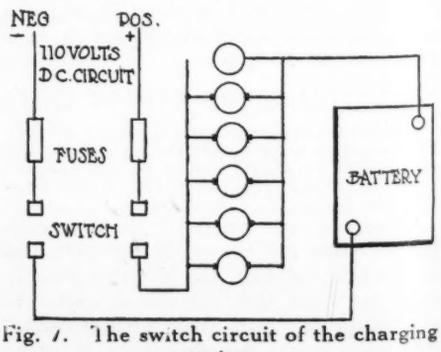


Fig. 7. The switch circuit of the charging system

2—A wiring diagram of the system is shown in Fig. 9.

3—This car was made by the Michigan Motor Car Co., Kalmazoo, Mich., but it is now out of production. Parts can be had from the Puritan Manufacturing Co., Detroit, or Michigan Motor Car Parts Co., Kalamazoo, Mich.

Engines

ONE PIECE COUNTER BALANCE CRANKSHAFT FOR FORDS

Q—Publish the address of a firm that makes a one-piece counter-balanced crankshaft for a Ford car.

2—Is a crankshaft similar to the one mentioned above hard on the main bearing?—Fred Gosenberg, Solon, Ia.

1—There is no firm that we know of that is manufacturing a one-piece counter-balance crankshaft for a Ford.

2—The counter-balance of a crankshaft gives a condition of less strain on the main bearing than the drop-forged crankshafts now used.

POOR COMPRESSION IN CADILLAC

Q—What was the standard gear ratio of the 1913 Hudson 37?

2—I am using a Cadillac rear axle with ⅜ to 1 ratio. Would this ratio be too high for a cut-down car using 37 by 4½ tires from the standpoint of power rather than unusual speed? If so, what ratio is recommended?

3—What should be the compression of this engine. I have only 40 lb. although pistons and valves have been tested under air pressure and found absolutely gas-tight. This seems to indicate too large a combustion chamber, so expect to plane off the bottom of the block. Is this advisable, and if so how much should be planed off to get the correct compression?

4—Is there danger of the top ring raising above the cylinder wall?

5—If this plan is not advisable could some flat or conical disk be welded on the piston heads?—Harold J. Paul, Bisbee, Ariz.

1—The standard gear ratio of the Hudson 37 is 3.90 to 1.

2—The ratio is not too high, for the Cadillac cars have delivered plenty of power at ratios as high as this.

3 and 4—The compression of this engine should be at least 70 lb. If new pistons have been installed it is possible that the pistons chosen have too short a shoulder which would lower compression. We believe that you have pistons and valves which are not gas tight and we advise the refitting of new pistons and rings. The engine has been designed with a correct size of combustion chamber and we do not think the cylinder block should be planed off. If too much is planed off the block, the top piston ring may rise above the cylinder wall.

5—The welding of disks on the piston heads will add weight and probably spoil the balance of the engine.

FOULING OF PLUGS ON A FORD

Q—What causes too quick carbonizing on a 1915 Ford fitted with a Ford-Kingston carbureter? The front plug fouls and stops firing frequently. Often the plug becomes dirty in a mile or so; then again, it will run 150 or 200 miles without having to be cleaned. The second plug causes some trouble, but Nos. 2 and 4 seldom need cleaning. The car uses too much gas as 16½ miles is the maximum mileage. The ignition seems to be all right, compression same in all cylinders; a good quality of oil is used. The difficulty is increased by cold weather.

2—Is the carbureter handling the fuel properly?

3—Can it be that the fuel is not vaporized properly, perhaps condensing in the forward part of the manifold and feeding almost pure gasoline to the front cylinder?

4—Are there other carbureters for Fords which will handle the present-day grade of fuel better than those now in use on this car?—Roscoe C. Morgan, Corydon, Ia.

1 and 2—A great many Ford owners are having the trouble of number 1 and 2 spark plugs fouling. This may be attributed to several reasons. It is a question of proper handling of the fuel and of course involves the manifold design, condition of the valves, carbureter adjustment and the effectiveness of the ignition system. It is claimed that due to the intake manifold design, the lighter parts of the gasoline go to the number 3 and 4 cylinders and the heavier to cylinders 1 and 2. This means a rich mixture in the first two cylinders and the fouling of the plugs with a collection of moisture on them indicates incomplete combustion. This may be caused by poor ignition and it is advisable to see that the ignition system is in first class order. Some Ford owners claim that this condition is greatly improved by adjusting the carbureter so as to obtain a very lean mixture. When starting the engine will probably miss until it is warmed up.

3—See 1.

4—There are late models of carbureters which will probably handle the present-day grade of fuel better than the older models.

HORSE POWER OF TRACTORS

Q—Explain the difference in horsepower between the Waterloo Boy and the Hart-Parr tractor. Both have the same bore and stroke, the same make and size of carbureter, use the same fuel and make the same speed. One is rated 12-25 but developed only 21.5 hp. at the Ohio demonstration; the other, rated at 15-30, at the same demonstration show 37.5 hp. —Adolph Grover, Wimbledon, N. Dak.

As you say these engines have the same sized bore and stroke cylinders, the same number of cylinders and both engines are designed to run at the same r.p.m., 750 in fact. We can not but feel that the test at the demonstration was made under conditions that did not prove favorable to both engines. These engines should develop the same horsepow-

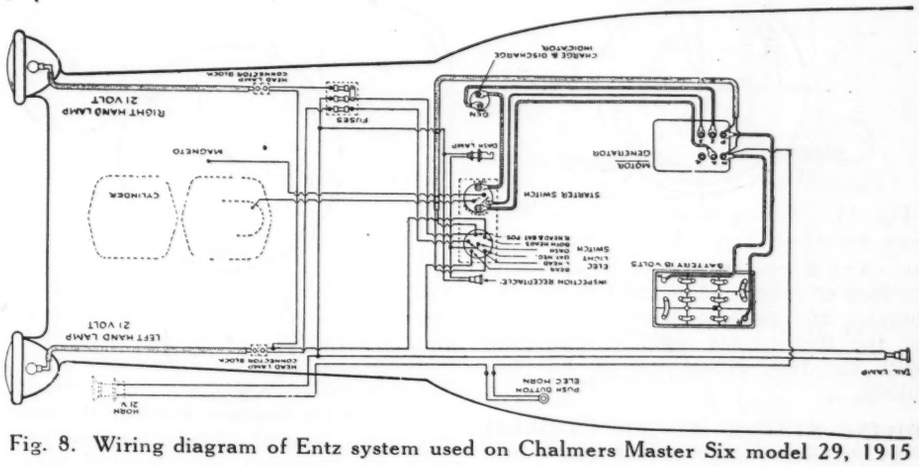


Fig. 8. Wiring diagram of Entz system used on Chalmers Master Six model 29, 1915

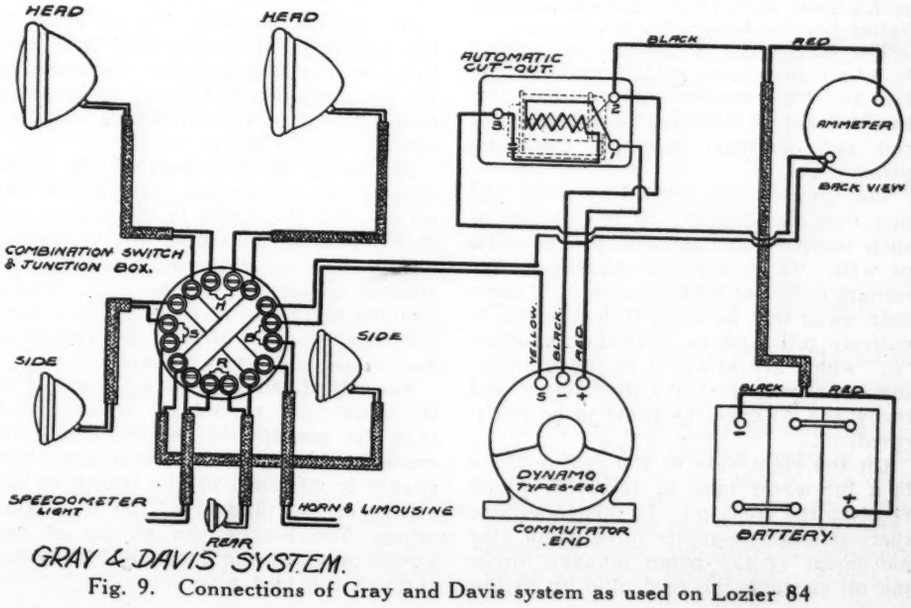


Fig. 9. Connections of Gray and Davis system as used on Lozier 84

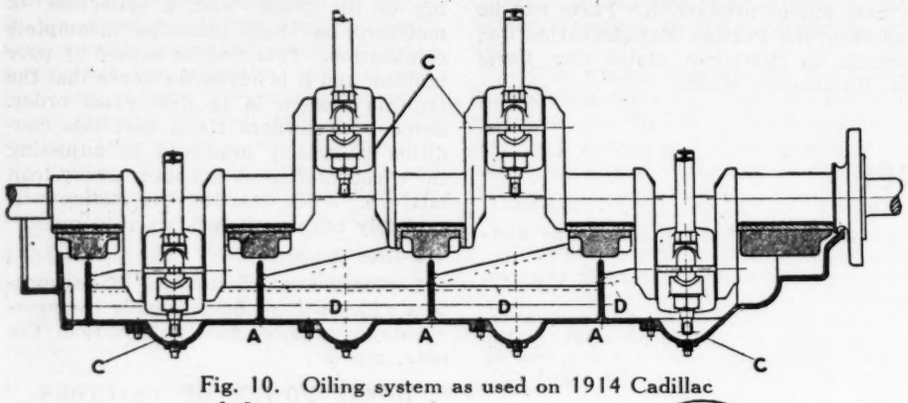


Fig. 10. Oiling system as used on 1914 Cadillac

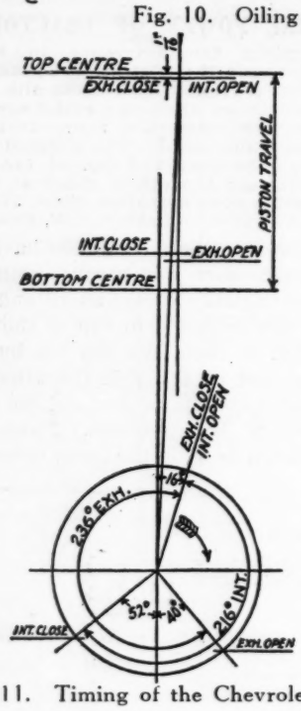


Fig. 11. Timing of the Chevrolet 490

er. Any discrepancies can be attributed to lack of proper adjustment of the carbureter and perhaps incorrect readings of the instruments used in connection with the test, although it is not very likely.

OILING SYSTEM ON 1914 CADILLAC

Q—Illustrate oiling system and course of oil flow on a 1914 Cadillac.—Guyan Valley Garage, Logan, W. Va.

The lubricating of the Cadillac engine is by an automatic splash system. See Fig. 10. This system takes care of the five crankshaft bearings, the connecting rod and camshaft bearings, cylinders, pistons, etc.

The crankcase is divided by walls "A" into four apartments. In the bottom of each compartment there is a depression or well. The crankcase should always contain sufficient oil so that each of these four wells will be from three-fourths to entirely full and so that the splashers "C," which are attached to the connecting rods, will dip into the supply and throw the oil over the parts to be lubricated.

On the right side of the engine there is a lubricator tank or reservoir which receives the fresh oil. In this lubricator there is a double-acting force pump. One movement of the pump plunger forces the oil through the feed pipe up to the sight feed on the dash. The oil drops to the bottom of this sight feed and from there is drawn by the other movement of the pump plunger and forced to the third compartment of the crankcase to maintain the supply there.

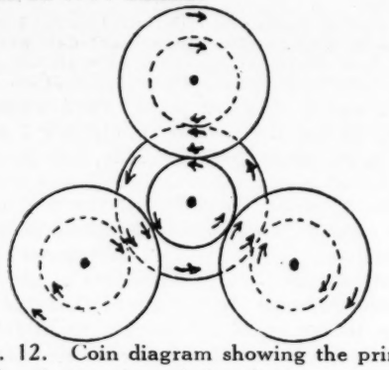


Fig. 12. Coin diagram showing the principle of operation of the planetary transmission as used on the Ford car when used in low gear

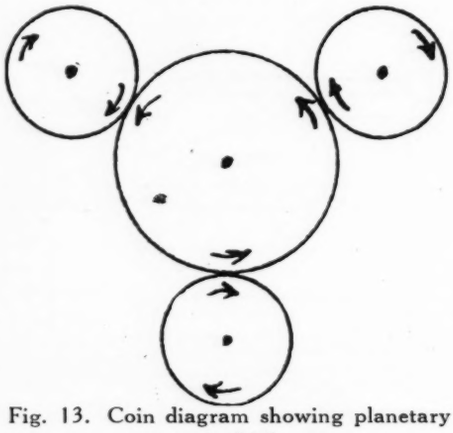


Fig. 13. Coin diagram showing planetary system in high gear

As stated, the splashers at the lower end of the connecting rods throw the oil all over the inside of the engine and that which is now used in lubricating drains down the inside walls and into the sloping troughs D, at the side. These troughs carry the oil from one compartment to the other so that the supply is maintained uniformly in each.

The adjustment for the oil supplied to the crankcase should be so regulated that the quantity in the wells will be maintained as before mentioned. The supply is governed by the length of the stroke of the plunger of the lubricator pump. The longer the stroke of the pump plunger, the more oil is forced through the feed pipe.

On top of the lubricator, on the plunger, there are two notched collars. The upper one is the adjusting collar attached rigidly to the plunger. The lower one is the locking collar. To adjust the stroke of the plunger, first loosen the locking collar. Then to increase the supply oil, turn the adjusting collar to the right, screw it down. Doing this gives a longer stroke to the plunger. After making an adjustment, be sure to lock it with the locking collar.

To supply oil to the crankcase it is necessary to remove the cap which covers the filler hole. There is but the one.

FORD PLANETARY TRANSMISSION

Q—Does the revolutions per minute determine the horsepower of an engine?

2—How can one increase the horsepower?

3—Explain and illustrate how to adjust the timing on a Chevrolet 490 without going into the timing gears.

4—Explain principle of a Ford planetary transmission; as the gears always are in mesh, what action takes place in changing speeds?—Herbert Ludwig, Rockford, W. Va.

1—Within limits the horsepower of a gasoline engine is directly determined by the revolutions. When the speed becomes excessively high, the horsepower of the engine drops or does not increase in the same proportion because the resistance to the flow of the gas through the ports becomes so high that the volumetric efficiency of the engine is materially reduced.

2—By increasing the speed. This can be done by installing lighter weight reciprocating parts, using a more efficient ignition system, (a two spark system for instance), fitting larger valves, and inlarging the valve ports, and increasing the compression. The latter can be done by fitting pistons with a slightly higher crown.

3—We are somewhat in doubt as to what you mean, but the valve timing diagram is shown in Fig. 11. On model "Four-ninety" the intake valve begins to open when the piston has traveled 1-32 in. below "top center."

4—A planetary transmission is one in which groups of gears always remain in mesh and revolve around a main axis. The different sets of gears are brought into action by stopping the revolution of the parts which support the gears, and is accomplished by means of bands, similar to brake bands.

The action of the transmission gears can be worked out by taking a few coins or washers. Place one coin in the center and three coins around and touching the central coin as shown in Fig. 12. When the central coin is revolved it will revolve the three other coins in the opposite direction.

Now, if we place a second coin of similar size over the central coin and three other coins of larger size over the three outside coins as shown in Fig. 13, we have the principle of the low speed gears.

By revolving the small central coin it will tend to revolve the three outside coins. As these three coins are supposed to be connected to the coins beneath

them, these three lower coins will tend to revolve the central coin, but at a much lower rate. The reverse gearing operates on the same principle, except that an additional pair of gears is used which causes the direction of rotation to be reversed.

CRANKING TROUBLE WITH 1912 FORD

Q—Explain why it is impossible to crank a 1912 Ford touring car with the high-speed lever back or out of high. Can crank it when we throw high-speed lever in gear, or in high, push the car back and forth, then throw high-speed out.—H. H. J., Ogden, Iowa.

This trouble is probably caused by a worn clutch lever screw. The illustration in Fig. 14 shows this screw. It is probable that this screw is worn to the point where it does not allow the clutch to become disengaged when the lever is pulled to the vertical position.

INSTALLING INTAKE MANIFOLD ON 1911 MITCHELL

Q—I want to install a short intake manifold on a cut-down 1911 four-cylinder Mitchell. As the magneto is on the intake side, it will be necessary to use an exhaust manifold. Would it be satisfactory?

2—Want to run a ⅜ inch copper tube through the intake manifold, connecting it with the exhaust pipe. Would this superheat the gas?—Reeves P. Sykes, Alliance, Ohio.

1—An installation of this kind would not prove satisfactory and would not improve your present condition very much. The cross sectional area of the exhaust pipe is too large to allow the necessary speed of the gas charge and in addition, the interior of the pipe is very rough. The effect of not having sufficient speed of the gas would be a large amount of condensation.

2—Running a ⅜ in. copper tube would aid in heating the gas just as the hot spot design does but will not superheat the gas. This tube would be objectionable when placed inside the intake for it would just be an obstruction which would retard the velocity of the flow of gas.

ELIMINATION OF STICKING VALVES

Q—Explain the valve mechanism and give best way to eliminate sticking valves on a 1919 Franklin.

2—Publish information on the intake manifold and its principle of operation.

3—What is the bore and stroke?

4—Give diameter of the crankshaft.—Harry F. Pesel, Louisville, Ky.

1—Both the intake and exhaust valves are made of chrome-vanadium steel; the exhaust valve has a thin ring of cast iron welded to its seat to counteract pitting. Valve operation is by means of a single camshaft working through lifter rods and walking beams. The entire mechanism is enclosed. To remedy sticking valve stems, squirt kerosene down around the stem and work the valve up and down and around.

2—The manifold is of the type that might be called the trombone horn manifold. The purpose of the double and return bend in the manifold is to give better gas distribution. The gases when entering, say cylinder one, will be drawn to this port opening on the bottom lead of the manifold and also slightly from the top lead. Cylinder five in firing next draws the gas from the top lead, because the inertia of the moving gases keeps them moving around the manifold, and it therefore is not necessary to completely reverse the flow of the gases. This it is claimed increases the efficiency of the manifold.

3—The bore and stroke is 3 1-4 by 4 in.

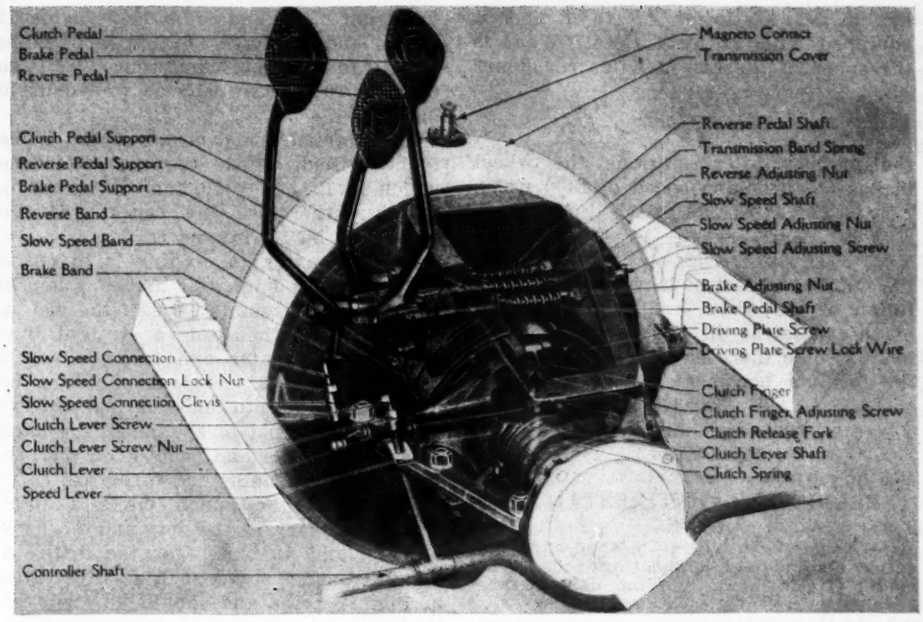


Fig. 14. Transmission and control lever on the Ford. The clutch lever screw nut this case is probably at fault

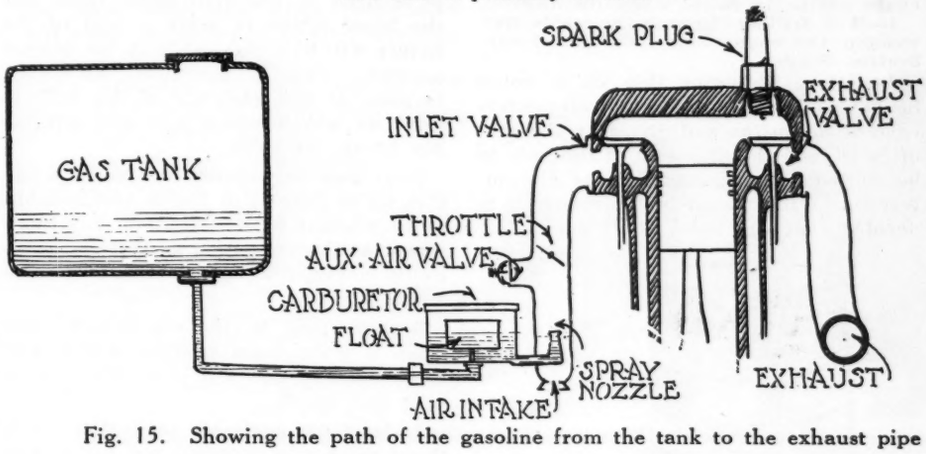


Fig. 15. Showing the path of the gasoline from the tank to the exhaust pipe

PRIMING

Q—Can straight benzine or a few drops of ether added to gasoline be used for priming a car? Are they better than high test gasoline?—A. L. Bye, Cedar Rapids, Ia.

It is not uncommon practice to use a small quantity of ether in gasoline for priming purposes. This can be kept in a squirt can or used in the priming device and it will be effective. Remember that the ether will evaporate easily, however. It is a difficult matter nowadays to get high test gasoline to be used for any purpose.

BEARINGS

Q—The center bearings in a Ford engine are worn, due, I believe, to the rear bearing becoming loose, although the engine bearings have been adjusted. These worn center bearings have put the magneto out of adjustment. Is the babbitt too soft and would a bronze bearing be better?—Frank A. Pelican, Hillhead, S. D.

1—The wearing of the main bearings may be due to two things in particular. The crankshaft may be out of round or the babbitt may be poor. There has been a great deal of trouble with babbitt and in all probability this is the cause of the trouble. A bronze backed bearing would be much better but it is essential that a certain amount of babbitt be used in the bearing.

POSSIBLE SPEED OF A CAR

Q—Publish power curve of the Stutz G engine 1919?

2—What is its gear ratio, bore and stroke, and revolutions per minute?

3—What factors enter into the computation of the possible speed of a car?—A. S. Hunter, Durham, N. C.

1—We have not enough information to enable us to publish a power curve of the Stutz engine.

2—The gear ratio is 3.75 to 1, and the bore and stroke 4⅜ by 6. The revolutions per minute are unavailable.

3—The factors that enter into the computation of the possible speed of a car are the r.p.m. of the engine, the diameter of the wheel, and the gear ratio. For example: a car is traveling with a speed in miles per hour corresponding to an engine speed of 2400 r.p.m.'s. It

has a gear ratio of 4.5 to 1 and is equipped with 32 by 4 tires. What is the speed of the car in miles per hour?

$$\frac{2400}{4.5} =$$

the number of revolutions the wheel makes at an engine speed of 2400 r.p.m.

$$\frac{32x3x3.1416}{12} =$$

the number of feet of travel in one revolution of the wheel and this multiplied by 60 equals the distance covered in one hour. Since there is 5260 feet in a mile the formula becomes

$$\frac{2400x32x3.1416x60}{4.5x5280x12} =$$

50.5 m.p.h.

SPEEDING UP CONTINENTAL ENGINE

Q—Advise best drilling method of lightening pistons and connecting rods on a model C Continental engine designed to develop 40 hp. at 1500 r.p.m.

2—Is it possible to increase the speed to 2000 r.p.m.?

3—Will end play in the crankshaft cause engine to rattle when running?

4—Will drilling through the inside web weaken the connecting rods?—J. Henry, Seattle, Wash.

1—Before beginning this job it would be advisable to measure the circumference of the piston and divide by the sum of ½ in. and the diameter of the hole to be drilled. For instance, if the circumference of the piston is 12 in. and it is decided that the holes shall be ¾ in.:

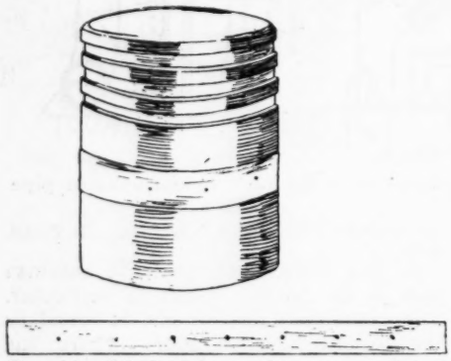


Fig. 16. Method for making a templet to drill holes in iron pistons to make them lighter

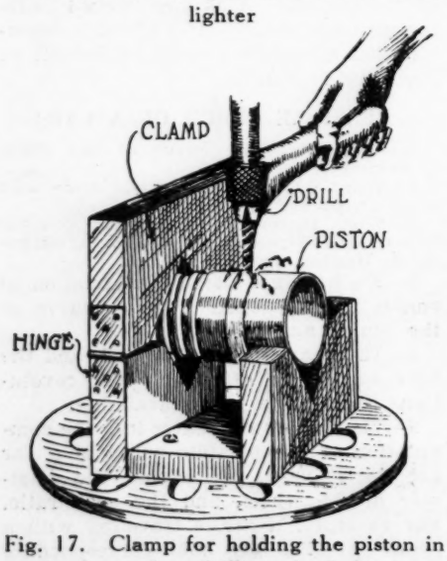


Fig. 17. Clamp for holding the piston in place when drilling the holes

The sum of ½ and ¾ is 1¼. Divide 12 by 1¼ and you have 9.6, that is 9.6 holes to drill to fill the circumference. 9.6 is so close to 10 that we may as well drill 10 holes.

To establish the centers of the holes to be drilled, divide the circumference which is 12 in. by 10 and the result is 1.2 in.; therefore the centers of the holes will be 1.2 in. apart.

A simple way to do this is to cut a strip of paper 1 in. wide and of a length equal to the circumference of the piston. See Fig. 16. Then rule a straight line through the center and make a pencil dot at every 1.2 in. along the line, or divide this line into ten equal parts. Next apply a light coat of shellac to the back side of the paper and paste it on the piston where the holes are to be drilled.

With a center punch make a light mark over each of the dots and we have a mark and a starter for the drill. A simple wooden stand such as illustrated in Fig. 17 helps and should be made so that the piston can be held properly and steadily while being drilled. This stand is secured to the drill press table and the lever which is made a part of the fixture will hold the piston in the desired position. This is absolutely necessary because of the tendency of the drill to work its way to either side and invariably break the drill.

2—It may be possible to speed the engine up to 2000 r.p.m. but is questionable as to whether it will result in any more power as the design shows that the maximum horsepower is developed at 1500 r.p.m.

3—End play in the crankshaft indicates a worn main bearing which will cause rattling and will eventually give a very bad knock.

4—It is not advisable to drill through the web of a connecting rod for it will lessen its tensile strength.

HYDRAULIC RAM

Q—Explain and illustrate the principle of a hydraulic ram.—B. D. Warren, Hopkinsville, Ky.

The hydraulic ram invented by Montgolfier is an arrangement by which the energy of falling water is applied so as to raise a portion of it to a greater height than the reservoir from which it is fed.

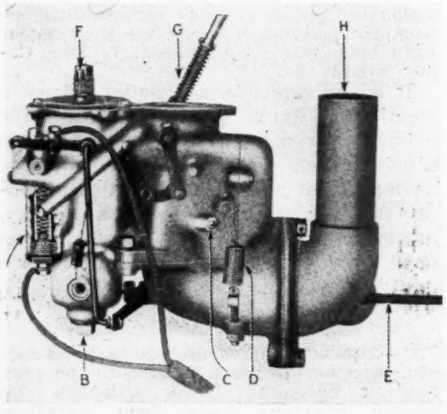


Fig. 18. Carbureter used on Franklin car made by the Franklin company

The principle of such an arrangement is represented in Fig. 19, in which E is the reservoir, A the pipe in which the water falls, B the channel, which should be long and straight, a and b the valves, a opening downwards and b upwards. C the air-chest, and D the rising main. Water first flows out in quantity through the valve a, and as soon as it has acquired a certain velocity it raises that valve, and the aperture is shut. The impact thus produced, acting on the sides of the pipe and on the valve b, raises this valve, and a quantity of water passes into the reservoir C, compressing the air in the space above the mouth d of the rising main D. This air by its elastic force closes the valve b, and the water which has entered is raised in the main pipe D.

As soon as the impulsive action is over, and the water in the channel is at rest, the valve A falls again by its own weight, the flow begins afresh, and when it has acquired sufficient velocity the valve b is again closed, and the whole process is repeated.

In this way water can be raised to a height many times as great as the difference in level from E to the valve b. If no energy were lost in friction, and in raising the valves, the height of ascent would be to the fall as the quantity of water which flows out at a is to that which is raised. Thus 1-5 of the water flowing out of the channel could be raised to four times the height of the available fall.

CANADIAN AND AMERICAN BUICKS

Q—What kind and make of engine is used in the 1919 McLaughlin motor car?

2—Is the engine in the Canadian Buick the same as that used in the American Buick, or is it one similar made by the Northway Motor Co.?—J. W. Owens, Bijou Motor Parlors, Lethbridge, Alberta, Canada.

1—This company makes three types of cars, four models being mounted on a 118 in. wheel base chassis, two models on a 124 in. wheel base chassis and the four models on a 112 in. wheel base chassis. The first two chassis models use the Buick engine and the third one uses the Northway engine. All are of six-cylinder construction.

2—From our records engines in the Canadian Buick and the American Buick are the same.

TIMING OF 1915 4-CYLINDER LOZIER

Q—Instruct how to time the 1915 4-cylinder Lozier.—W. Bowden, Brooklyn, N. Y.

When timing the valves it will be noticed that both the camshaft and crankshaft sprockets are marked, thus simplifying the timing process. Between

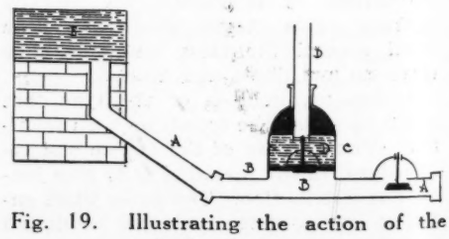


Fig. 19. Illustrating the action of the hydraulic ram

the camshaft and crankshaft sprockets in the engine front end case is an indicator, with two points indicating in the direction of the two sprockets. If the driving chain is removed for any reason the engine can be retimed by bringing these two marks on the sprockets in a line with the indicator and then attaching the chain.

To set the magneto in proper relation to the engine, insert a wire about 12 in. long through the priming cup in No. 1 cylinder and locate the upper dead center on the compression stroke. This position should be determined as accurately as possible. Next place the breaker box assembly on the magneto in its fully retarded position. Remove the cover plate from the breaker box and turn the armature of the magneto in the same direction as the engine rotates until the distributer carbon brush points are just ready to open. Hold the position of the magneto and engine stationary and attack the magneto to its driveshaft and make the connections tight.

MISSING

Q—What causes missing, over 20 miles per hour, on a 1917 Hupmobile? There is no backfire and no firing in the muffler. The car runs nicely for a short distance, then starts to limp—acts as if some counter force were being set up temporarily to offset the development of power. It has no pick up; seems to have plenty of power as it acts well on hills, considering the periodical loss of power. The car never has been speedy and reaches its maximum speed at about 32 m.p.h., although it has reached 35 but only under the most perfect condition at rare intervals.—H. L. Waltham, Alliance, O.

1—This missing is undoubtedly caused by poor carburetion. If the gasoline feed pipe is partially clogged the engine will operate all right at slow speeds because a certain amount of gasoline gets by the obstruction. If the engine is speeded up, there is not sufficient gas flowing to the carbureter to supply the demand and the result is that the engine will miss.

MISSING AT 30 M.P.H.

Q—When a 1914 model B-40 cutting attains a speed of 30 miles per hour and is held there it starts to miss, then loses speed and continues missing until it is necessary to change to second or low and make a fresh start; it will then run all right until the 30-mile mark is again reached. A Wisconsin engine with Remy magneto is used; a Rayfield carbureter has been supplanted with a Stromberg and a vacuum system installed. Having the magneto repaired and cylinders rebored does not eliminate the trouble. What is the cause?

2—What speed should I get if the wheels are cut from 36 by 4 to 33 by 4 or 34 by 4?—C. E. Dauwalter, Dauwalter Garage, Carver, Minn.

1—From the conditions mentioned it is very hard to determine just what causes this trouble. It may be a result of faulty wiring which would give you momentary shorts caused by the excessive vibration, or improper working of the vacuum system. The intake manifold may be loose allowing air to be sucked into the cylinders which would also cause missing. We believe the trouble is that the gasoline system is not furnishing enough fuel after a certain speed is reached, and results in starving the engine, causing it to miss. See that the gasoline feed pipes are free from dirt and then remove the vacuum tank and soak it in kerosene. This will loosen the working parts, perhaps remedying the poor valve action in the inner tank, and when re-installed will work properly and in all probability eliminate your trouble.

2—Cutting the wheel size from 36 by 4 to 33 by 4 will cut down your speed about three miles per hour.

RATTLING IN BRISCOE

Q—What causes a rattling sound, similar to a valve tap, in a Briscoe 4-24; the bearings are tight and valves properly adjusted? Could this be the oil pump?—Carl Shepherd Newark, Ohio.

1—This rattling sound may be caused by any one of a great many things, but we believe that the valve tappets are out of adjustment. It may be a piston slap, the fan touching some part of the frame or most any two pieces of metal slapping together. The only way it can be found is by process of elimination.

CRANKSHAFT BEARING OF A 1917 MAXWELL

Q—The rear main bearing in the crankshaft of a 1917 Maxwell is loose and should have several shims taken out. How can one gain access to this bearing?—Albert A. Heller, Natrona, Pa.

The bearings on the Maxwell engine cannot be adjusted or removed without removing the crankshaft and this can be better accomplished by dismantling the engine which should be removed from the frame for this purpose..

KNOCK IN 1918 FORD

Q—My 1918 Ford, which has been driven approximately 13,000 miles, hits on all four cylinders, but when going down a slight decline, or when the car is pushing the engine slightly, develops a knock. It is a heavier knock than that caused by advancing the spark too far and is not so audible after the engine is thoroughly warmed up. Sounds as though it might occur from a loose main bearing or is it in the transmission?—T. P. Hayes, Eckford, Mich.

Judging from the description of your trouble it is our opinion that this knock is caused by a loose rod. This is the indication given by a loose rod. To find the cylinder, you might try opening the pet cocks one at a time and if the knock disappears then you have located the position. If the vibrator of the coil is held down and the noise stops then this will determine the location.

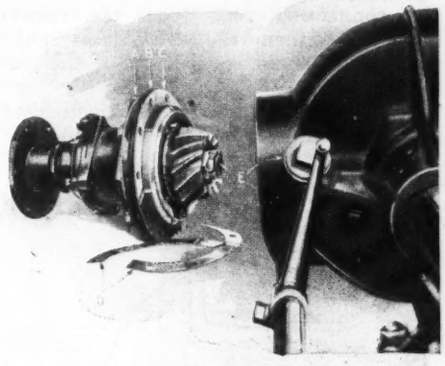


Fig. 22. Franklin rear axle with pinion gear removed showing adjusting shims

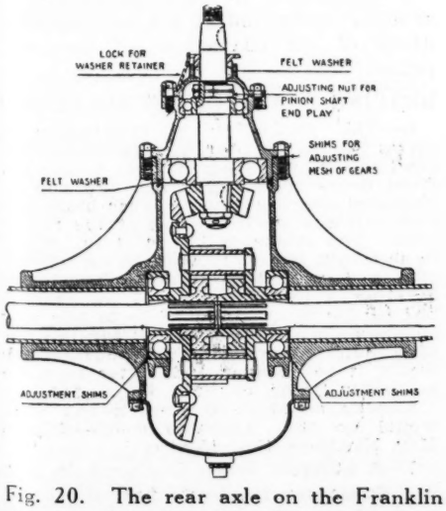


Fig. 20. The rear axle on the Franklin showing the adjustable shims for movement of the ring and pinion gear

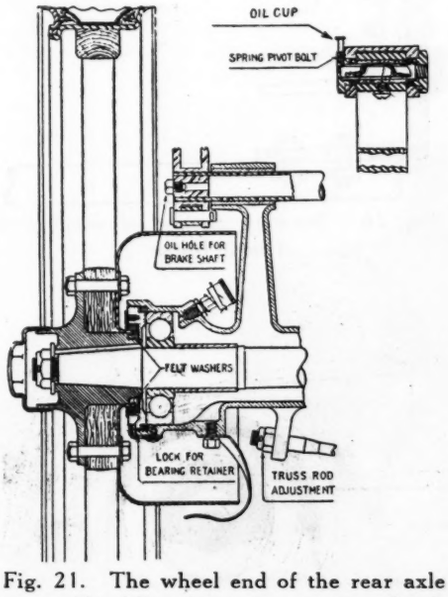


Fig. 21. The wheel end of the rear axle on a Franklin showing position of adjustment

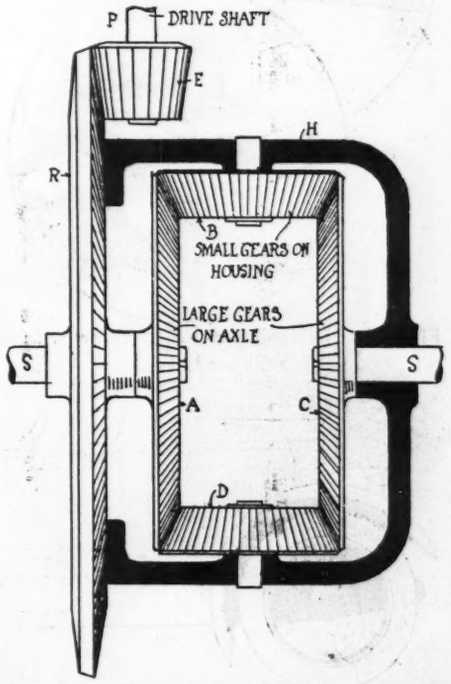


Fig. 23. Diagram showing operation of a typical differential

LOOSE BEARINGS IN A HAYNES 36

Q—No. 4 and 6 rod bearings in my Haynes 36 loosen in about two or three hundred miles; a new block, pistons, pins and valves have not overcome the difficulty. Is the crankshaft out of round, and if so could I true it with an abrasive tool?

2—Would I have to polish the shaft?

3—Can the pistons be removed without taking off the blocks?

4—Explain method of adjusting the clutch.

5—Would a high-tension magneto be practical on this car?—W. S. Reamon, Tipton, Mo.

1—The loosening of the bearing may be caused by the crankshaft being out of round or by poor babbitt in the bearings. There has been a great deal of trouble with bearings due to the softness of the babbitt being used. If the crankshaft is out of round it may be trued with an abrasive tool listed in the advertising columns of MOTOR AGE.

2—If the crankshaft is trued in this manner it is very advisable to polish the shaft.

3—The pistons may be removed from the bottom of the engine by taking off the oil reservoir. It is unnecessary to remove the cylinder block and the pistons may be pulled out by disconnecting the connecting rods from the crankshaft and turn the crankshaft until there is sufficient room to allow the piston to pass.

4—The dry disk clutch is constructed so as to be very easily adjusted. To make the adjustment, lift out the floor boards of the forward compartment and remove the large cover plate just in front of the gear shift lever on the transmission. By turning the engine, either by the starting motor, the crank, or by moving the car with the third or high gear engaged, two adjusting bolts may be observed. Press down on the clutch pedal and hold the clutch out. Loosen both bolts and gently tap either one of the bolts in a clockwise direction about a quarter to a half an inch, according to the amount of take-up required, and then allow the clutch to engage. The clutch will be a perfect adjustment if the distance between the brake faces at the back of the throwout yoke is about a half inch. All that is left to complete the adjustment is to tighten up both adjusting nuts. The entire operation should not require more than five or ten minutes.

When the clutch is adjusted properly, the clutch pedal will usually set an inch or so lower than the brake pedal. Should the clutch braking surfaces fail to touch when the pedal is pushed down as far as it will go, the rod on the pedal shaft lever to the short lever on the transmission should be lengthened slightly by running the yoke end out farther.

5—The installation of a high-tension magneto would be practical but since the system already used is very reliable we do not think it is worth the trouble of putting it in.

Rebuilding

REBUILD ESSEX

Q—I want to rebuild my Essex chassis with bucket seats into a rakish type of car, retaining the standard hood and cowl, the bevel edge feature on the rear deck and doors, and using the gas tank and tire carrier as at present. I have dropped the steering post and want to use individual mud guards. Would a black deck set off to advantage black mudguards, nickle radiator and green wheels and bonnet?—John C. Mahoney, Poughkeepsie, N. Y.

An illustration showing this design is depicted in Fig. 25.

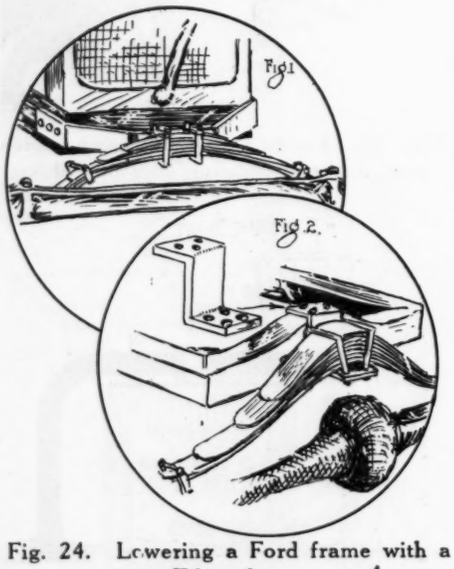


Fig. 24. Lowering a Ford frame with a Z-bent bar

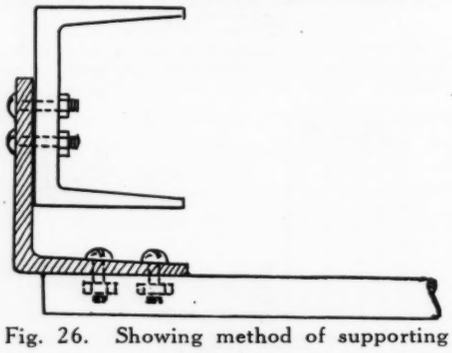


Fig. 26. Showing method of supporting a bent frame

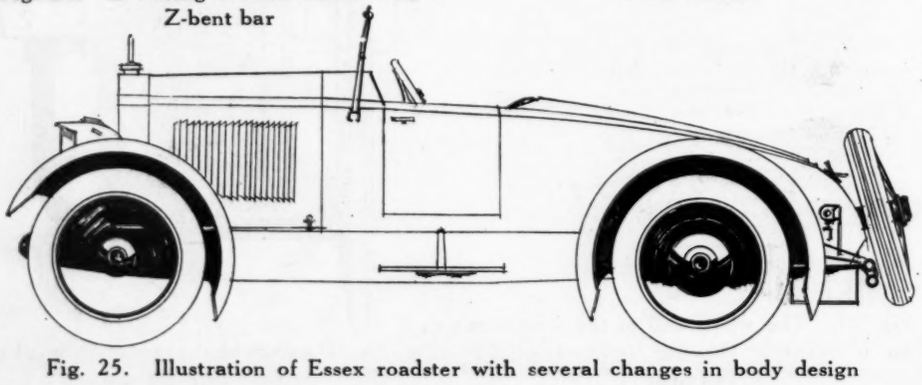


Fig. 25. Illustration of Essex roadster with several changes in body design

UNDERSLINGING A FORD

Q—In underslinging a Ford kindly explain if the engine is lowered with frame (side members). If so, how is front of engine fastened and what provisions are made for cranking?—Herbert Barber, Ashland, Ky.

As a rule the engine is left as it is and the frame is dropped by having the spring bracket brought back of the axle and then lowered. These fittings can be purchased on the open market. When the engine and frame are lowered in this manner it does not interfere with the starting crank, so this will not trouble you in the least.

The back end of the frame is sometimes bent and in other cases a dropped bracket is used.

One way to drop a Ford frame is shown in Fig. 24. In this case a piece of 2 in. by ½ in. iron was used, and was bent to form a blunt point in front, about 8 in. from the cross member of the frame. The ends were bolted to the side pieces of the frame. The side of the spring was brought in front of the blunt end of the bent bracket and the clips put on sidewise. The radius rods were then attached to the side of the frame and bolted thereto. By this scheme the engine was dropped practically 5 in. The back end of the frame was dropped by using a bracket similar to that shown in Fig. 24, one of these being used on each side.

REBUILDING A FORD

Q—Would the power and mileage of a 1919 Ford be increased by installing a Dunn counterbalance, a Rajah valve and Leak-Proof piston rings? If so, how much?

2—Do you recommend lapping in rings with valve grinding compound?—Ray B. Redmon, Shoshone, Idaho.

1—An installation of this kind would improve power conditions and give more mileage. We cannot make any statement as to how much would be gained but it is great enough to warrant the installation, providing you intend to rebuild the car for some special purpose.

2—Lapping in piston rings with valve grinding compound is not advisable because of the coarseness of the compound.

BRACING FRAME OF STUDEBAKER 4

Q—The frame on a Studebaker 4, series 17, is bent or sprung under the cowl so that the hood does not fit and the front doors stock. Sometime ago you illustrated and described a truss brace but this will not work because of the radius rods. The frame is 1½ by 4 in., which is certainly too shallow for a car of this size and weight. I have thought of building a new frame of 5 in. channel but hardly think it would do to buy new side members as these would sag in time. If a suitable brace would be installed, would it be cheaper and better to make a heavier frame, or have one made?

2—Who could do this work and what would be the probable cost?—Eugene Hay, Newhope, New Mexico.

1—A suitable brace is shown in Fig. 26. Straighten the frame first of all and then take a piece of angle iron about 4 ft. long and bolt it to the frame as shown

in diagram. Allow the angle iron to extend down about 2 in. and you can probably place a cross member from one side of the car to the other of the 4 ft. angle iron. If it is impossible to place to cross member the method of bracing suggested will be a great help.

2—It is impossible to state the cost as it depends upon the cost of the material and the man who does the job.

THE GOLDEN EGG

Q—What is the highest powered racing car now manufactured; give the horsepower developed and number of cylinders.

2—Give the horsepower of the Golden Egg—Barney Oldfield's Special.

3—Publish photograph of Barney Oldfield's enclosed racing car.—B. H. Britzke, Sherill, N. Y.

1—The highest powered racing car now in use is the Packard 905 which has 905 cu. in. displacement, twelve cylinders, and develops about 440 hp.

2—Barney Oldfield's Golden Egg develops about 160 hp.

3—The Golden Egg is shown in Fig. 27.

SERVICE TRUCK

Q—Publish suggestion for converting a 3-4-ton Reo truck, without body and cab, into a service truck equipped with a stationary Manley crane, Weaver auto ambulance and towing pole, 10-ton jack, 5-gal. gasoline can and other equipment for wrecking purposes.—James Grat, Baltimore, Md.

This is shown in Fig. 26.

Miscellaneous

CARBURETER ADJUSTMENT ON 1919 FRANKLIN

Q—Give adjustment of the carbureter on a 1919 Franklin.—Harry F. Pesel, Louisville, Ky.

The carbureter is made by the Franklin company especially for their car. Both the needle valve and air intake are adjustable from the dash.

Normally, the distance from the bottom nut on the float valve stem to the beginning of the seat of the stem should be 5-8 in. With this setting, the level of the gasoline is 1-32 in. below the spray nozzle openings. Screwing the adjustment nuts up, lowers the level, screwing them down, raises it.

Hard starting, "loading up," missing, and lack of power may indicate that the auxiliary air valve needs adjustment. First, be sure that the valve seats properly, and then change the tension of the spring acting on the valve stem lever by adjusting the screw to which the spring is attached. Adjust so that when the engine is stopped or throttled down very slow, the valve will seat, but only so lightly that it will open as soon as the engine is accelerated.

If the needle-valve works to easily, tighten clamp screws on the front of the cash, or, by using washers, increase the tension of the coil spring where the needle-valve shaft enters the carbureter. If the needle-valve binds, oil its parts and loosen the clamp. Sometimes it is necessary to take the valve completely out of the carbureter and clean the threads before it will turn easily.

CARBURETER ADJUSTMENT ON 1914 MERCER

Q—Give complete adjustments of the Fletcher carbureter used on a 1914 Mercer.—L. Ballitto, Chicago.

Throttle the engine down and screw the low-speed adjustment (which is marked) up or down one notch at a time until the engine runs apparently even, firing on each cylinder; then accelerate the engine quite rapidly and adjust the high-speed spring in the direction marked "more air" until the engine pops back through the carbureter when accelerated rapidly.

As soon as this system occurs the operator will know that the mixture is too lean or is getting too much air, and the high-speed spring should be moved back one notch at a time in the direction marked "less air" until this popping ceases, and no more. The adjustments should not be made when the engine is cold. It should be alowed to warm up, running idle for at least five or ten minutes before adjustment is attempted.

FORD CARBURETION

Q—What would you consider the best carbureter on the market for a Ford?

2—What is a good device for heating the gas before it goes into carbureter of Ford?—Edward Stowe, Los Angeles.

1—We cannot state which carbureter is best for Ford cars as the claims made the carbureter company are similar but we believe that any of them will give good satisfaction.

2—There are several patented primers on the market which heat the gasoline by electricity.

STEAM INJECTION

Q—Explain why moist air or steam fed into the intake manifold of a gas engine makes it run so much faster, and does it give increased power?—N. G. Cole, Sacramento, Calif.

According to tests made recently by the Bureau of Standards, there is no power gain or decrease of carbon deposit when water is injected into the engine, except in case of engines with defective cooling systems. The results arrived at have been summarized by the experts of the Bureau of Standards somewhat as follows:

No appreciable effect is produced upon the power, fuel economy and general operation of a gasoline engine by the injection of water into the cylinders at rates varying 0.03 to 0.44 lb. per brake horsepower hour. When water is injected at a higher rate than 0.44 lb. per brake horsepower hour there is an appreciable decrease in the power output, fuel economy and smoothness and operation. It is quite probable that in a badly carbonized engine, or an engine of defective design, in which there are hot-spots that cause pre-ignition, the injection of the water results in an increase of power.

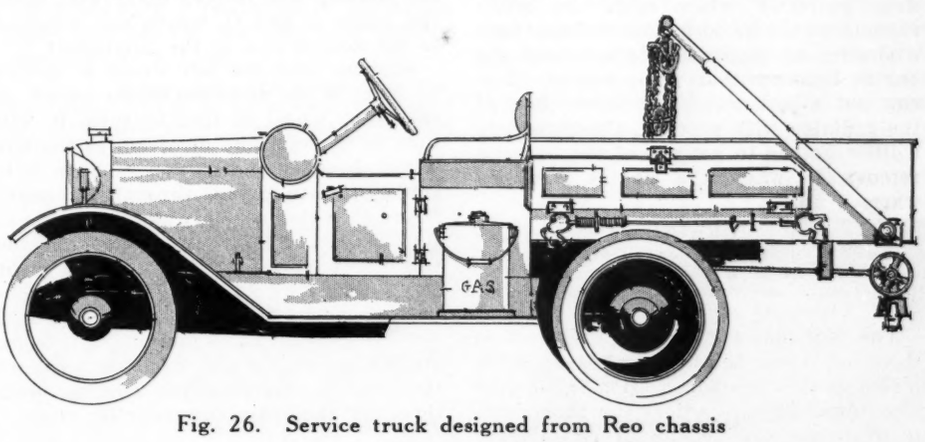


Fig. 26. Service truck designed from Reo chassis

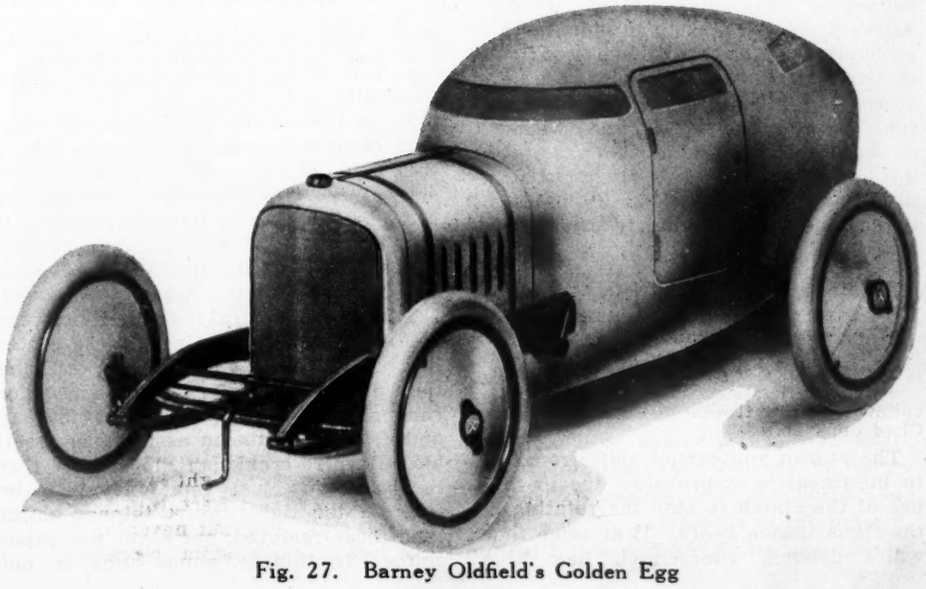


Fig. 27. Barney Oldfield's Golden Egg

In an engine operating at high water-jacket temperature the injection of water in amounts between 2 and 8 lb. per hour produces a softening and slight reduction of carbon, this reduction not exceeding 25 per cent and being most noticeable on the piston heads and valves. However, water injection at the maximum rate also causes a considerable reduction of power.

IMPROVING CARBURETION

Q—I am having trouble getting the correct gas mixture in my 1915 Maxwell 25, which has an extreme long manifold and the carbureter a small range of adjustment. Would a new carbureter made to handle present-day fuels help without making a change in the manifold?—George A. Mason, Worthington, Minn.

Due to the condition of present-day fuel carbureters have changed greatly in design. The installation of a new carbureter would undoubtedly improve the performance of your engine without any change in the manifold.

CARBURETION

Q—What size wire gauze should be used between a carbureter intake manifold, the 80 mesh? This is for a Mitchell E 5-40 with Rayfield carbureter. Hot air attachments are used. Cylinders one and two do not fire properly when the engine is sold.—Cotton States Motor Car Co., Memphis, Tenn.

We would advise against this practice, as it will be the means of setting up refrigeration and thereby choking up to some extent the intake passages. It should be remembered that no engine fires perfectly when cold. A better scheme would be to fit the radiator with a shutter to keep out cold air until the engine becomes thoroughly heated. You can put a pad across the lower half of the radiator with success, although it is a little bother to get out of the car and remove it when the engine becomes warmed up.

JERKING

Q—Explain why an overhead Chalmers 6-40 jerks at 15 miles an hour when the accelerator is released.—Harry J. de Bock, Cleveland.

The fact that the car jerks when it is throttled down below 15 miles an hour indicates that the carburetion is poor. If it is impossible to adjust the carbureter to overcome this jerking it is probably caused by worn intake-valves. If these valves are loose enough to spin there is probably enough leakage to prevent good carbureter adjustment. This condition allows the outside air to come in direct contact with the valve, and when it comes in contact with the gas taken through the manifold, it causes condensation and a choking effect which makes the engine pull irregularly causing the car to jerk.

SHIFTING STUDEBAKER GEARS

Q—A Studebaker Six 1914 model when running the gears cannot be shifted from low to intermediate. When the car is standing still the gears shift freely. They are in good shape so how could you account for this trouble?—Cecil E. White, Chadron, Neb.

The reason you cannot shift from low to intermediate is probably due to failure of the clutch to stop the rotating of the transmission gears. If at some time while driving, the clutch has been jammed in, it is quite possible that the shifting fork is bent which will prevent the clutch from entirely disengaging.

OVERLAND UNIVERSAL

Q—Will a universal from an Overland model 85-4 fit an Overland 83-B without any change?—Geo. E. Shields, Whitewater, Wis.

The dimensions of the universals used on these two models are so nearly alike that they may be fitted to either car without any changes.

DIFFERENTIAL ACTION EXPLAINED

Q—With reference to your answer to my query about "Fast and Slow Wheels" in the Dec. 4 issue of Motor Age. You say the slow wheel will be on the inside when the car is making a turn, and in this case the greater part of the drive comes on the outer wheel. Do you mean to say that more power is transmitted to the fast wheel? How is it that I find the slow or anchored wheel causes the bevel gears in the differential to revolve on the spider and cannot understand how this end of the axle could get less of a pull from the propeller shaft. Do not the teeth of the bevel gear come in mesh as soon as the others disengage?—J. J. Albrecht, Marion, S. Dak.

Your difficulty is in the understanding of the operation of the differential. Referring to Fig. 23, R is the ring gear which engages with the pinion E, the pinion E being driven from the propeller shaft P. The ring gear is attached to the spider housing, as can be seen from the sketch, they will turn with the housing, but not upon their own axis. The gears B and D being carried around with the housing will in turn carry with them the gears A and C, which are attached to the square end of the driveshaft S.

Suppose that the left wheel is turned by hand in the direction of the arrow. If the right wheel is free to turn, it will turn in the opposite direction to the left wheel, because the motion of gear A is transmitted to gear C through the gears B and C, which act only as idler gears in this case. Idler gears always reverse the direction of rotation. If the right wheel is not free to turn, which is probably due to a tight brake, the motion of A will be transmitted to the idlers. C being stationary, the idlers will turn around the gear C, carrying the housing with them and thus turn the propeller shaft.

ADJUSTMENTS ON A 1919 FRANKLIN

Q—How are the main and connecting rod bearings on a 1919 Franklin adjusted? 2—How is the differential adjusted? 3—The rear axle?—Harry F. Pesel, Louisville, Ky.

1—To tighten the connecting rod bearings remove the bearing cap and take a thin shim of same thickness from each side of the cap. Replace the cap and draw the nuts up as tight as possible. If thinner shims are not available, put old shims in their original places and file a small amount of the bearing cap itself.

Take up wear in the main bearings one at a time, and begin with the center bearing. Remove the bearing cap and take a thin shim of same thickness for each side of the cap. Replace the cap and draw the nuts up as tight as possible. Revolve crankshaft, to be sure that the bearing is just tight enough to be felt. If too tight, insert thinner shims than those removed, but never use paper shims. If thinner shim stock is not available, put old shims in their original places and file a small amount off the bearing cap itself. Great care must be taken to file the bearing cap squarely. Then put bearing in place and revolve the crankshaft as before. If the bearing now fits perfectly, loosen it slightly so it will not affect the next bearing when its adjustment is tried. After adjusting all the remaining bearings in the same way, give them their final tightening and replace cotterpins in bearing bolt nuts. It is rarely necessary to scrape the babbitt bushings except when the engine is given a complete overhauling.

2—The bevel gears are positively adjusted by shims. There are no screw adjustments except the one that takes up bearing wear on the pinion shaft. To mesh the pinion deeper into the bevel drive gear, withdraw the pinion unit Fig. 20, and remove one of the thin shims between the pinion housing and the rear axle housing. The meshing of the gear and pinion may be inspected through the large plug hole in the left front side of the gear case. The edges of the gear teeth should be approximately flush.

To move the bevel gear sideways take out the driveshafts (axles) and the bevel gear unit, after which the unit can be shimmed in the necessary direction.

3—There are only one or two adjustments on this axle, one is the truss rod adjustment and the other the lock for the bearing retainer both of these are shown in the illustration in Fig. 21.

OVERSIZE TIRES FOR BUICK

Q—What is the correct oversize tires for a Buick C 25 equipped with 32 by 3½ tires? Is 33 by 4 or 32 by 4 correct? Rims are quick detachable straight side. —Earl J. Offere, Geneseo, Ill.

The correct oversize for a 32 by 3½ in. tire is 33 by 4 in. If you wanted to use 32 by 4 in. you would have the felloes cut down and new bands substituted. This, then, would call for new rims all around.

HOW POWER IS OBTAINED FROM GASOLINE

Q—Publish diagram showing the action or change in gasoline as it passes from the tank through the carbureter and engine to the muffler, and the result of this action.—J. Lawrence Kizer, King Motor Car Agency, South Bend, Ind.

The liquid gasoline flows by force of gravity or is drawn by a vacuum from the tank to the carbureter. This liquid passes into a float chamber and is held at a certain level by means of a steel pin which is operated by a float. The carbureter is fitted with a suitable device for admitting air and gasoline to the mixing chamber. On the intake stroke of the engine a certain amount of gas from the mixing chamber is drawn into the cylinder as a result of a partial vacuum created by the piston. This gas is compressed by the piston on its next stroke and when fully compressed is ignited. The burning gas expands, driving the piston down on its power stroke. The exhaust valve then opens and the burned gases are expelled on the next stroke. The gas engine is a heat engine and the power is dependent upon the number of heat units that can be gotten out of the gasoline. The action is shown in Fig. 15.

Law in Your Business

By Wellington Gustin

SEEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. MOTOR AGE presents here the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty points as may be submitted him.

BATTERIES INSTALLED NOT SATISFACTORY

WHAT CONSTITUTES RECISSION OF CONTRACT

DELAY HELD UNREASONABLE AND GARAGE MAN ENTITLED TO RECOVER

The Bashaw-Joy Company of Davenport have won their suit against Walsh which was brought to recover for furnishing defendant with a new set of batteries for an electric automobile, and for certain repairs and extras thereon. The contract was in writing in the form of a letter or proposition from the garage company to Walsh and accepted by him. Walsh denied that the contract was complied with; and alleges that he tendered the battery back to plaintiff as soon as he discovered it was not of the kind and quantity agreed upon, and filed a counterclaim, alleging that the old battery, which was in the car, and which plaintiff agreed to take, was the value of $150. By an amendment to the counterclaim,, Walsh asked damages in the further sum of $400, because the battery placed in the car by the Bashaw-Joy Company had to be replaced, to his damage; and the further sum of $100, because the battery which plaintiff placed in the car was defective, and that the car was damaged in the removing of said battery. There was a trial by jury which returned a verdict for $395.10 against Walsh.

Walsh appealed the case to the Supreme Court of Iowa, but there the judgment was affirmed. The two main points in the case were whether the garage firm had installed the electric batteries as per the agreement and as to the alleged recission of the contract by Walsh when he found out as he claimed, that the batteries were not according to the agreement.

The law on the point laid down by the court is that before the purchaser can rescind the contract on account of the failure, if so, of the garage man to furnish the batteries contracted for, he, the purchaser, must tender back to the garageman the battery furnished and do so within a reasonable time after he discovered that they were not the batteries contracted for, and purchaser cannot keep and use and retain control over the batteries as his own, after making such discovery, and at the same time claim a rescission of the agreement.

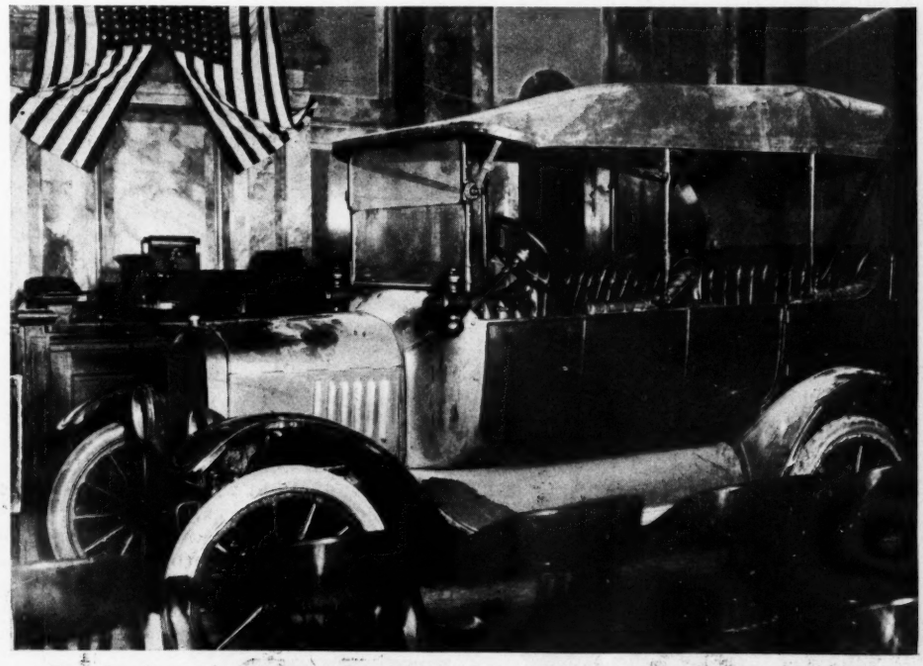
But if the batteries furnished were not the batteries contracted for, and if within a reasonable time after the purchaser discovers such to be the fact, he tenders same back to the garageman, and thereafter does not keep and use and retain control over them as his own, then there is a rescission of the contract by the purchaser. The court found Walsh had not made such a rescission of his agreement and upheld the judgment against him (14 N. W. 399).

Editor Motor Age:—Is there any law or ruling where a distributor of trucks is prohibited from issuing an itemized invoice of a truck; showing the cost of chassis, cab, body, freight, war tax, war tax on body, and extra cost for pneumatic tires.—Central Garage & Repair Co., Oskaloosa, Ia.

Replying to the above will say there is no such rule or principle known to the common law and I know of no statutory law, nor ruling having the force of law, that might be construed to prohibit the giving of such information either on an invoice or otherwise. As a matter of fact the invoice is usually the place where such information may be given. However, it is not necessary. Again, I believe it would be against the policy of a state to prohibit the giving of such information and why single out the invoice to suppress it I can see no reason. Hence I am led to believe the prohibition as referred to does not rest on a basis in law.

In your case it may be that your distributor has reference to a ruling of the manufacturer or of some trade association of the manufacturers. In such a case such a rule would only rest on private agreement or contract between the parties.

The Star Witness



For the first time on record an automobile has been moved into a courtroom as evidence. This unusual event took place in the Bronx County Supreme Court, N. Y. City, where Ernest Fritz is on trial charged with the murder of Mrs. Florence Coyne. Mrs. Coyne was riding in the automobile at the time of her death. The machine had to be hoisted into a window in the courthouse

The Accessory Corner

New Fitments for the Car

Cleroline is applied to windshields

Wagner Tire Chain Tightener

This is a very handy little tool that enables the motorist to apply his tire chain without getting out every monkey wrench and screwdriver and pair of pliers in the car and makes it unnecessary for him to soil his clothes and hands when applying the chains. The chain is rolled over the tire as usual and the ends of the chain are driven by the combination lever tongs. A twist of the handle then tightens the chain sufficiently to allow the snap fastener to close. The other end of the chain tightening tool can be used as a tire tool because the end of it is fashioned for this purpose. This tool is made by the Wagner Mfg. Co. Cedar Falls, Iowa.

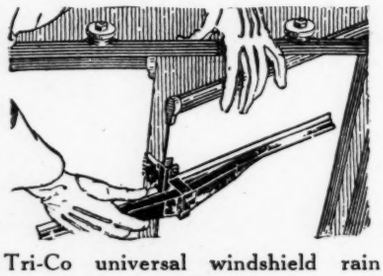
Rose clutch leathers

Rose Clutch Leathers

A full line of clutch leathers suitable for most cars using cone clutches is made by the J. H. Haney & Co. of Hastings, Neb. Leathers are carried in stock to fit the Buick, Chevrolet, Overland, Studebaker, Dodge and other cars. These leathers are made from a special tanned leather which has proven to be very successful when applied to clutch band construction. The prices on these leathers vary from $2.60 to $4.20.

Tri-Co Universal Rain Rubber

Car owners who have cars that are not equipped with the double rain-vision windshield have undoubtedly experienced the difficulties of driving in a heavy rainstorm. There have been several attachments on the market for cleaning the windshield but they have been permanent attachments. The Tri-Co. Rain Rubber cleans the entire windshield clear across by simply pushing it with the hand. It is attached by opening the windshield. It is manufactured by the Tri-Continental Corp., Buffalo, N. Y., and is made to fit all two-piece windshields.



Tri-Co universal windshield rain rubber

Cleroline

Cleroline is a liquid chemical compound which is easily applied to any wet or dry windshield with a cloth, a sponge or a piece of tissue paper. One application of the compound will last for twelve to twenty-four hours through most severe weather. One feature of the compound is that it can be applied to a wet glass with the same effectiveness as a dry glass. The compound is manufactured by the Cleroline Chemical Co., Inc., 507 5th Ave., New York.

Wagner tire chain tightener

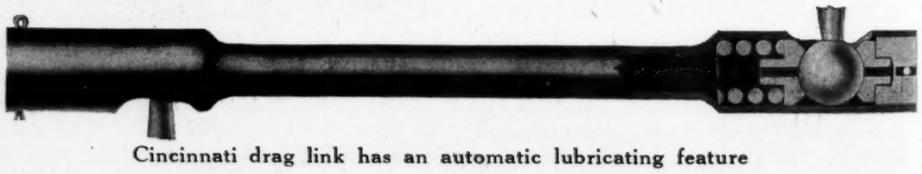
Cincinnati Drag Link

The Cincinnati Ball Crank Co. of Cincinnati, recently placed on the market an improved drag-link for motor cars and tractors. It is of a patented construction, and made entirely without welds—the sockets and connecting parts are all drawn from the same piece of metal, thus eliminating what has heretofore been a point of potential weakness.

The Cincinnati drag-link is also provided with an automatic lubricating feature. This makes for easier steering and also minimizes wear on the ball and socket of the link joint.

A heavy coil spring in the socket takes up wear. This spring is adjustable and can be regulated to any tension. There is no unnecessary play at any time.

Another feature of Cincinnati drag-link is that all parts are made to be interchangeable. The seats for both front and rear sockets are alike, thus making it possible to cut the number of service parts in half.



Cincinnati drag link has an automatic lubricating feature

Service Equipment
Time Savers of the Shop

Greb-Grip-Puller

A new type of wheel puller that can be adapted to many different usages is the Greb automatic grip puller made by the Greb Co., Inc., Boston. This puller is universal in character and can be used either as a two-jaw or three-jaw puller. The gripping tongs are pivoted on steel pins that allow the gripping levers to converge or diverge so as to grip any size article. This puller can be used as an arbor-press and to this end it is sold complete with two V slots and one V tape. It makes a very desirable piece of equipment for pressing off gears, bushings or bending pipes and straightening shafts.

TIGHTENING THE SCREW FORCES ALL JAWS INWARD AUTOMATICALLY DROPPING HOOK
FRAME DROP ON CENTRE BODY
PIN ATTACHED TO FRAME
BELL CRANK
CENTRE BODY
PRESSURE APPLIED WILL FORCE CENTRE BODY BACK AND ARMS INWARD
ALL ARMS ARE DROP FORGED STEEL
SHOWING LOCKING DEVICE
THIS SECTION PARALLEL TO SCREW WHEN ARMS ARE FULLY OPENED

Greb Grip Puller can be adapted to many usages

Reliable battery filler will facilitate putting water in the storage battery

Onan Testing Device

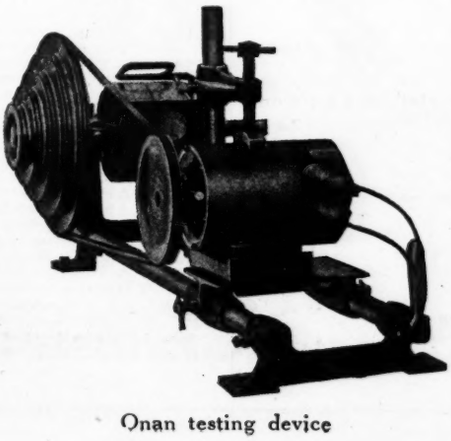
A garage man is continually coming in contact with the problem of having to remove the starting, lighting and ignition equipment and then after repairing it has no means of making a test without again installing it on the car. A testing device such as is shown in the illustration will be a great time saver as well as very accurate means of testing the equipment. The Onan testing device built by David W. Onan, 1224 Penn Ave., Minneapolis, is built to run from the regular line shaft furnished with tight and loose pulley with handy belt control or from a constant speed motor. The device complete with meter, mounting, cables and stand sells for $5 and weighs about 100 lb.

Reliable Battery Filler

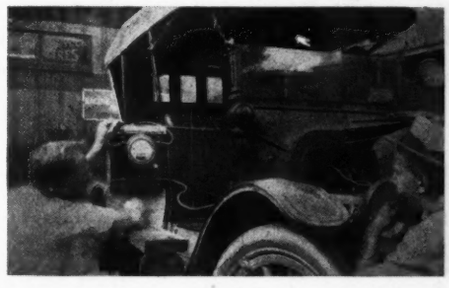
It is very unhandy when a battery requires an additional supply of water to have to pour it in through a small funnel or draw a small amount of water from a bottle with a hydrometer. The Reliable battery filler is composed of a metal stand with a handle attached in which a bottle of distilled water is placed and a tube leading from the base to be used in filling the battery, as shown in the illustration. It is built to fit any one gallon bottle and sells for $5. Made by the Reliable Mfg. Co., Cleveland.

Ford Magfixer

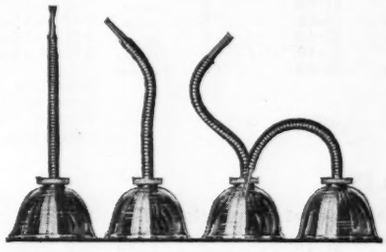
A Ford car comes into your service station because something is wrong. The owner is in a hurry and what he desires is to have his trouble remedied as quickly as possible. You guess at the trouble and finaly decide that it is the magneto. To get at the magneto means to dismantle the engine, which takes time and considerable expense. This represents what goes on in most every service station. The Stahl Rectifier Co., 1407 W. Jackson Blvd., Chicago, has a device which will enable you to give excellent service and correct a magneto trouble in about ten minutes' time. Connect the Magfixer as shown in the illustration and you can immediately tell where the trouble is located. If a short is indicated you need only to pull down a switch and any metal chips that may be causing the short will be immediately burned off. In case the magneto is weak, it can be remagnetized by simply pushing a make-and-break lever back and forth 4 or 5 times.



Onan testing device



Locating magneto trouble in the Ford with the Magfixer



Ducky oil can has flexible spout

Ducky Oil Can

The Ducky oil can which is shown in the illustration herewith is like other oil cans as far as the flexible bottom is concerned, but it is different in that it is equipped with a sprout that is flexible and that can be moved and adjusted to any desired angle. A flexible oil can spout of this type makes the inaccessible place of the motor car accessible. Another added advantage which this oil can gives is the insurance against breakage from rough usage. For example, if this oil can is dropped with its spout down the stem or spout of the can will not be broken or the seam of the pipe burst. Instead the flexibility of the spout will absorb the jar and the vibration and prevent any injury. This oil can is made by the Automotive Exchange of America, Cleveland.

Passenger Car Serial Numbers

Motor Age Maintenance Data Sheet No. 89

One of a series of weekly pages of information valuable to service men and dealers—save this page

METZ

Year	Model	Cyls.	Price	Serial Numbers
1912	22	4	$495	15000-18301
1913	22	4	495	18302-22949
1914	22	4	475	22950-28800
				(Also 300 cars numbered from 28801 to 29100 on which equipment determines model)
1915	22	4	495	29101-32200
				(All the above have double chain drive and 22 H.P. engine and are roadsters)
	25	4	600	33000-36380
1916	25	4	600	36381-40248
1917	25	4	545	40249-44552
1918	25	4	695	
1919	Master Six	6	1695	45015-47508
1920	Master Six	6	1895	47509 up
				Number on crankcase

MITCHELL

Year	Model	Cyls.	Price	Serial Numbers
1912	2-4 4-4 5-4	4	.....	22000-30000
	2-6 5-6 7-6	6	.....	
1913	2-4, 5-4	4	.....	30001-31500
	2-6, 5-6	6	.....	35000-36284
	7-6	6	.....	39500-39668
1914	A-40	4	.....	40501-41500
	A-50	6	.....	44001-46000
	A-60	6	.....	49001-49250
1915	B-35	4	.....	50001-51800
	B-45	6	.....	55001-56000
	B-48	8	.....	57001-57100
				Number plate on heel board of front seat, on right engine guard, and on left front frame member
1916	B-48	8	.....	58000-60000
	C-42	6	.....	60001-64905
1917	C-42	6	.....	65001-69956
1917	D-40	6	.....	70000-85000
1918	C-42	6	.....	90000-95000
1919	E-42	6	.....	95501-96495
	E-40	6	.....	97001-106400
1920	E-40	6	.....	1 up
				Number plate on left front door post near floor board, and on left frame member just ahead of radiator

MOLINE

Year	Model	Cyls.	Price	Serial Numbers
1912	M	4	$1700	2362-2785
1913	M-40	4	1950	2786-3999
			2500	
1914	MK-50	4	3250	4001-4999
			3800	
1915	MK-40	4	1375	6001-6250
1916	MK-40	4	1450	6250-7012
1917	G-50	4	1840	8000-8330
	C-40	4	1495	9000-10999
1918	G-50	4	2250	8331-8450
	L-40	4	2000	11000-11220
			2500	
1919	G-50	4	2250	8451-8999
	L-40	4	2000	
			2500	11221-11600

Name changed to R & V Knight in December, 1919

Name on dash plate and on front left side of engine

MONROE (Indianapolis)

Year	Model	Cyls.	Price	Serial Numbers
1919	S-9	4	$1295	16609
1920	S-9	4	1295	16610 up

MONROE (Pontiac, Mich.)

Year	Model	Cyls.	Price	Serial Numbers
1915	2	4	$495	501 up
1916	4	4	1095	8000 up
1917	3	4	565	4001 up
	6	4	1095	9151 up
1918	M-4	4	995	

MOON

Year	Model	Cyls.	Price	Serial Numbers
1912	30	....	.....	5371-5470
	40	....	.....	6022-7000
	48	....	.....	7002-7119
1913	30	....	.....	5472-5483
	39	....	.....	8001-8365
	48	....	.....	7121-7293
	6-50	....	.....	31002-31081
1914	42	....	.....	13001-14344
	4-38	....	.....	14401-14453
	6-50	....	.....	31082-41351
	6-40	....	.....	61304-61530
1915	4-38	....	.....	14451-14500
	6-30	....	.....	70000-70242
	6-40	....	.....	61531-61953
	6-50	....	.....	41354-41891
1916	6-30	....	.....	70245-70666
	6-43	....	.....	70667-71087
	6-44	....	.....	62053-62252
	6-66	....	.....	62253-66564
1917	6-43	....	.....	71088-71393
	6-45	....	.....	71394-71819
	6-66	....	.....	66565-66884
	6-36	....	.....	36000-36225
1918	6-36	....	.....	36226-36996
	6-66	....	.....	66885-67043
1919	6-46 Victory	....	.....	46001-47551
	6-66	....	.....	67044-66078
1920	6-48	6	.....	48001 up
	6-68	6	.....	68101 up
				Number plate on models without four doors on outside of body at door latch. On the four-door models, plates are on dash under hood or under front seat

MOORE

Year	Model	Cyls.	Price	Serial Numbers
1919	30	4	$895	1600
		4	995	7000 -8149
		4	1095	8000
1920	30	4	1095	8150 up
				Number under hood on right side of body; engine number on right side engine.

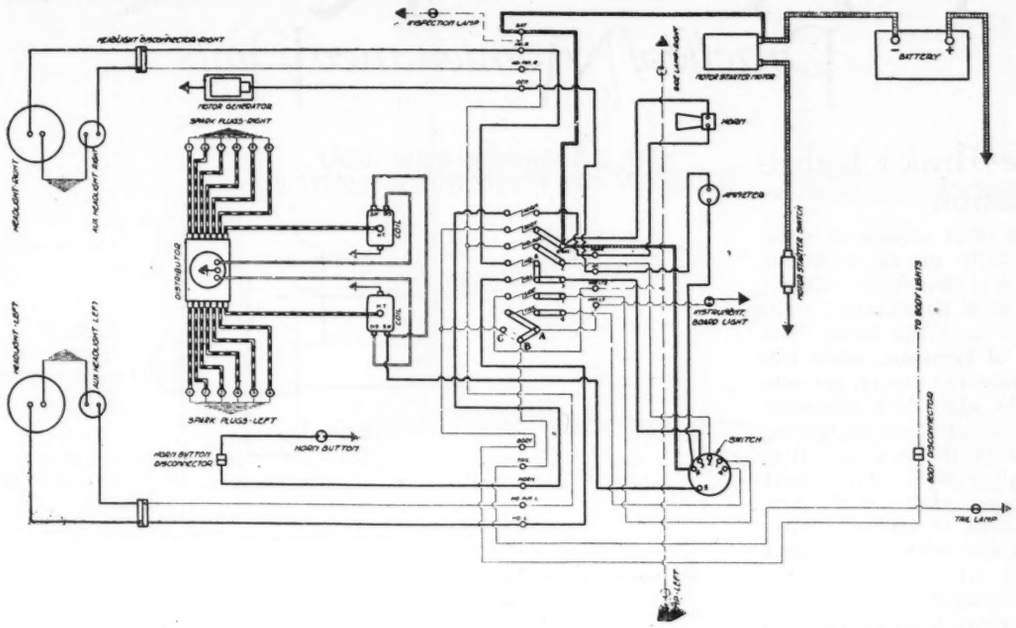
NASH (Formerly Jeffery) No yearly models

Year	Model	Cyls.	Price	Serial Numbers
	681, 5-P Spt.	6	.....	100101-100114
	681	6	.....	100612-111600
				127851-131825
	682, 7-P Tr.	6	.....	111601-113601
	683	6	.....	121001-122500
	684, Sedan	6	.....	100108-100611
				119851-121000
				144331 up
	685, Coupe	6	.....	94501-95000
				119913-119928
				144806-145405
				131851, 133251, 133351 up
	687, 4-P Rd	....	.....	
				Number on left front cross member, just back of radiator.

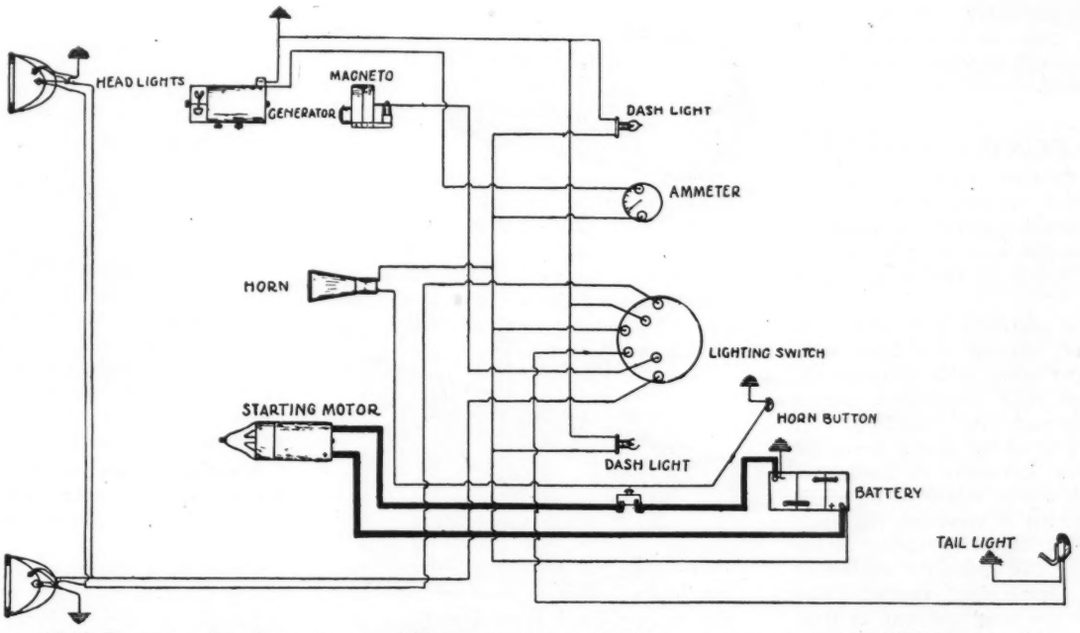
NATIONAL

Year	Model	Cyls.	Price	Serial Numbers
1912	MCC	4	$2900	5501-7000
1913	M3C	4	3300	7001-8100
	V-3	4	3400	8101-9000
1914	6-W	6	2375	9001-10100
1915	AA	6	2375	10101-11100
1915-16	AB	6	2500	11101-14000
1916	AC	6	1690	14001-16000
	AD	12	1990	16001-17000
1917	AE	6	1750	17003-18000
	AH	12	2150	18001-20000
	AF-1	6	1995	20001-24000
	AF-2	6	2150	24001-25000
	AK-1	12	2595	25001-25550
1918	AK-2	12	2750	25551-27000
	AF-3	6	2150	27001-28000
1919	AL	6	2450	28001-28979
	AM	12	3050	32000-32148
1920	BB	6	3290	60000 up
				Serial numbers on cars up to 1913 inclusive will be found riveted to the rear cross member of the frame. All cars after 1913 have the serial number on the left side of the frame, either under the front or rear fender.

Motor Age Weekly Wiring Chart No. 69



1918-1919 Packard, 3-25, 3-35, with Delco ignition and Bijur starting and lighting



1919 Roamer—Bosch ignition and Bijur starting and lighting used on cars No. 14005 up

THIS WEEK

1919—Roamer

1918-19—Packard

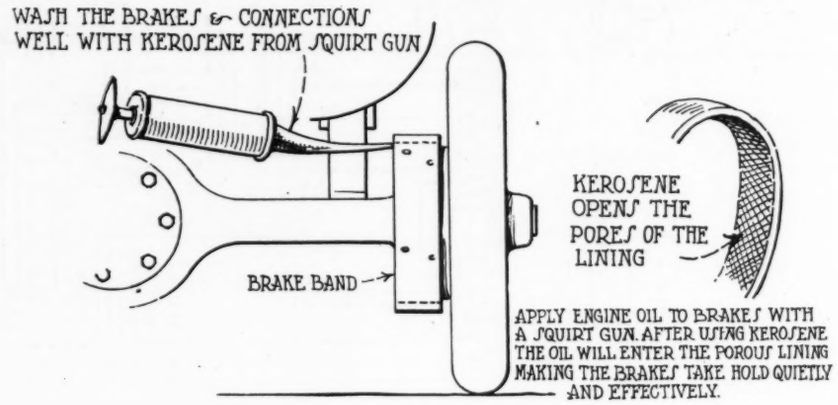
Allen—Dec. 18, '19
Auburn—Nov. 27, '19
Briscoe—Oct. 16, '19
Buick—Oct. 23, '19
Case—Oct. 2, '19
Crow-Elkhart—June 26, '19
Chalmers—Nov. 27, '19
Cutting—Nov. 6, '19
Daniels—Dec. 4, '19
Davis—Dec. 4, '19
Dorris—Dec. 11, '19
Empire—Oct. 30, '19
Essex—Oct. 23, '19
Ford—May 15, 22, '19
Franklin—June 19, '19; Dec. 11, '19
General Battery Charging—Sept. 25, '19
General Magneto Diagram—June 5, '19
Haynes—Oct. 9, '19
Hupmobile—Oct. 16, '19
Internal Connections—July 10-17-24, '19
Keeton—Nov. 6, '19
King—July 3, '19
Kissel—July 3, '19
Lexington—Jan. 1, '20
Liberty—Jan. 1, '20
Marmon—Dec. 25, '19; Jan. 22, '20
Maxwell—Aug. 14, '19
Mercer—Aug. 28, '19; Nov. 27, '19
Mitchell—Jan. 8, '20
Monroe—Oct. 30, '19
Moon—Jan. 29, '20; March 11, '20
Moore—March 4, '20
Nash—March 11, '20
National—June 19, '19; Feb. 12, '20
Oakland—Oct. 16, '19
Olympian—Jan. 22, '20
Owen Magnetic—Sept. 18, '19
Packard—June 19, '19; July 31, '19
Paige—July 3, '19
Paterson—June 26, '19; July 9, '19
Pierce-Arrow—Oct. 2, '19; Feb. 5, '20
Pilot—March 4, '20
Premier—Dec. 18, '19; Feb. 26, '20
Reo—Aug. 21, '19; Oct. 9, '19; Nov. 13, '19
Scripps-Booth—Jan. 15, '20
Stanley—June 26, '19
Stearns-Knight—Jan. 8, '20
Stephens—Feb. 12, '20
Studebaker—Dec. 25, '19
Stutz—Feb. 5, '20
Templar—Jan. 29, '20
Velie—Sept. 25, '19; Feb. 19, '20
Westcott—Jan. 15, '20
White—Sept. 25, '19; Feb. 19, '20
Willys-Knight—Feb. 26, '20
Special Systems for Fords—May 15-22, '19

The Automotive Repair Shop

Practical Maintenance Hints

Automobile Brake Lubrication

The bands of service brakes on automobiles receive little or no attention. The glazed surface of the lining does not act quickly, or is it dependable. The first step is to go over the lining with a squirt gun full of kerosene, while this is soaking well into the lining, go over the opposite brake also with kerosene, cleaning also the connections for inspection and adjustment if required. Give the kerosene a half hour at least to soak well into each lining, giving it the second dose of kerosene if desired. After this fill the squirt gun with clean engine oil and squirt this into the bands, leaving it to soak into the open pores over night. In the morning wipe off the surplus oil, start the car and apply the brake several times to get rid of any excess between the bands and the drums. Treatment of this nature, once each month or two, will provide dependable and silent brakes.

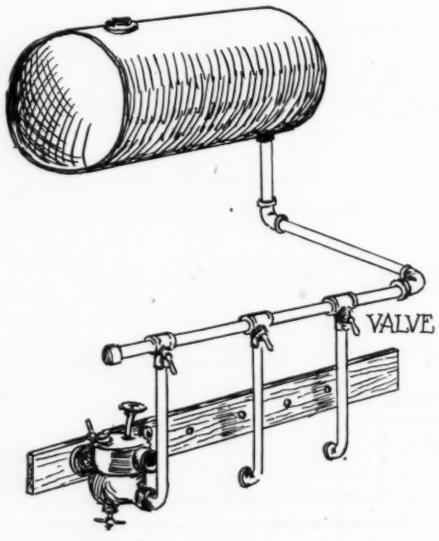

WASH THE BRAKES & CONNECTIONS WELL WITH KEROSENE FROM SQUIRT GUN
KEROSENE OPENS THE PORES OF THE LINING
BRAKE BAND
APPLY ENGINE OIL TO BRAKES WITH A SQUIRT GUN. AFTER USING KEROSENE THE OIL WILL ENTER THE POROUS LINING MAKING THE BRAKES TAKE HOLD QUIETLY AND EFFECTIVELY.

Restoring worn brake lining with applications of kerosene to make it silent and dependable

Piping Kerosene and Oil

The Bronx County Auto Co., one of the largest Ford dealers in New York City, has developed a simple method for delivering kerosene and cylinder oil by gravity to all floors of the service station.

Mounted on a platform just under the roof are two oil barrels, one filled with kerosene and the other with cylinder oil. A straight pipe runs from each barrel right down through the building. At each floor there is an oil and a kerosene faucet. So little kerosene is used that it is not found worth while to meter it but the cylinder oil is metered. At each floor there is a small Trident meter which measures the quantity delivered through that particular faucet. The meter registers the total amount as well as the quantity drawn each time.



Apparatus for testing a carbureter for leaks. This is used by one of the largest Ford service stations in Detroit

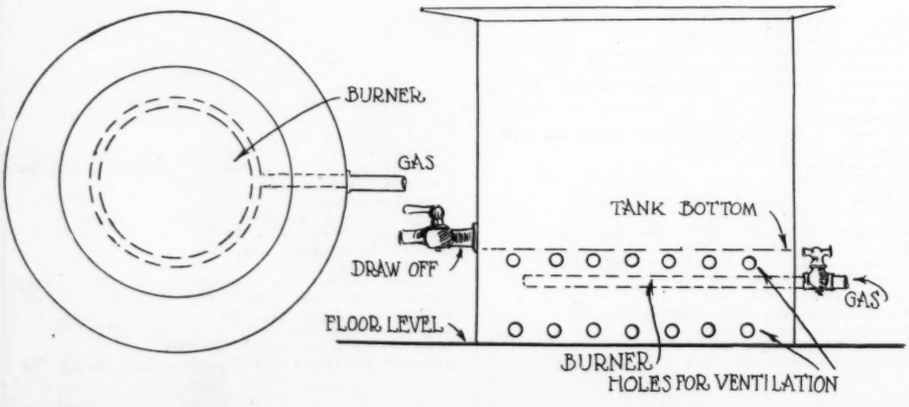
Hot Caustic Tank

There is nothing better for cleaning car parts than hot caustic soda but a suitable tank and a simple method of heating the liquid must be used. The tank illustrated is a heavy sheet-iron cylindrical tank 3½ ft. high and 3 ft. in diameter. A 9-in. lip running around the top facilitates the handling of parts and also aids in preventing splashing of liquid on the adjacent floor.

The lower end of the cylinder rests directly on the floor but the actual bottom of the tank is 6 in. above this, the intervening space being occupied by the gas burner. The burner consists of a circle of pipe drilled full of small holes and there should be the usual air mixing valve adjacent to the shut-off cock.

A series of holes drilled in the walls of the tank at the top and bottom of the burner chamber aid in the circulation of air.

There is a draw-off cock at the base of the tank to facilitate emptying. It is advisable to have a water faucet emptying directly into the tank so that it may be filled without any trouble.



Tank for holding hot caustic soda, with a simple method of heating the liquid. Draw-off cock at bottom facilitates emptying

Carbureter Tester

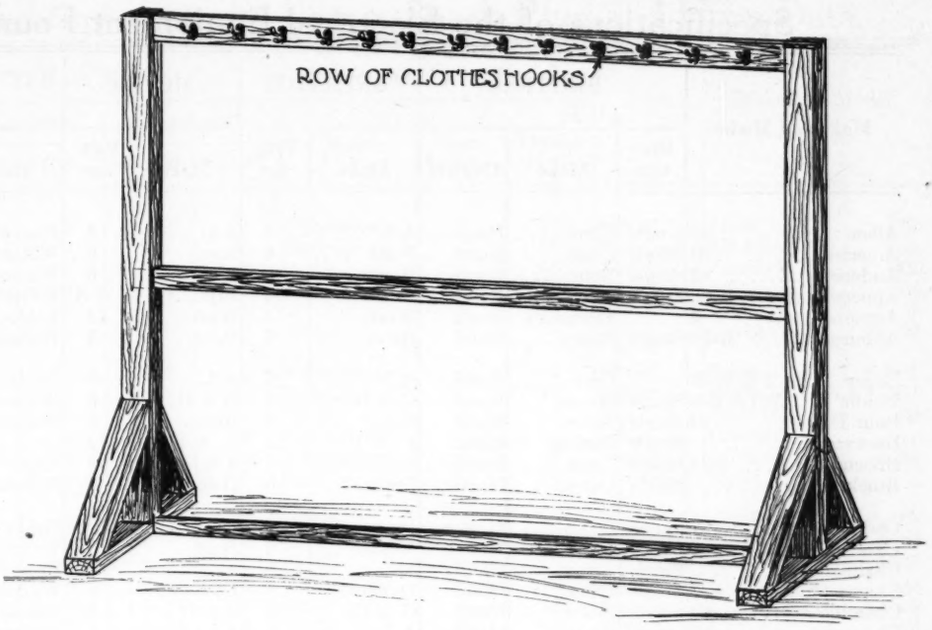
A simple and very satisfactory apparatus for testing a carbureter for leakage is shown herewith. The fact that it is used in one of the largest Ford service stations in Detroit makes it of special interest.

An ordinary Ford gasoline tank is used as a source of supply. From this a pipe delivers fuel by gravity to three separate lines each of which can be shut or opened by a small cock. A carbureter to be tested is bolted in place, the fuel line connected up and the valve opened.

No supports for this apparatus are shown as this depends on circumstances.

Clothes Rack vs. Lockers

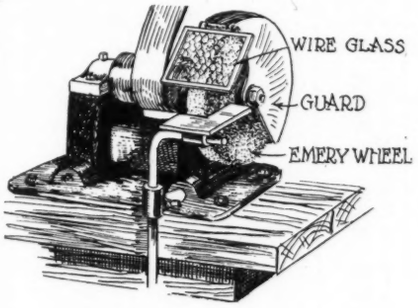
There are some who object to lockers because they are usually dirty and evil smelling. Others object to them because they cost money. For one or both of these reasons a clothes rack such as the one shown may find favor. It is made out of 2 by 3 in. stock and carries a double row of hooks, one row on each side, of the top cross member. It is good practice to have it washed with strong soap and water once a week as contact with work clothes is likely to soil it and this dirt in turn will be transmitted to street clothes which are hung on it during working hours.



An idea for a clothes rack is given above and is inexpensive to make

Emery Wheel Guard

A guard for the emery wheel is always a desirable safety measure. A wheel is liable to break at any time with disastrous results. Any man accustomed to work at any emery wheel will tell you of such accidents. In addition there is the possibility of particles of metal or abrasive being thrown up into the eyes of the operator. A guard which cuts down these hazards is distinctly worth while and such a guard is the one illustrated. It is simply a piece of heavy wire glass set in a substantial metal frame and hinged to the main wheel guard as shown.

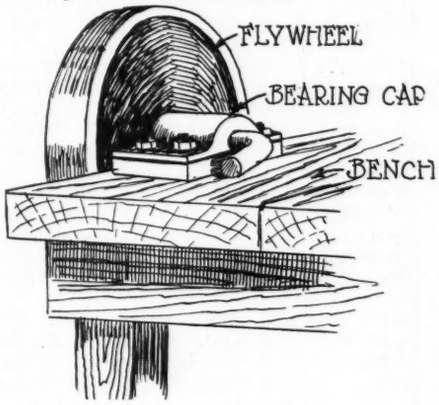


Emery wheel guard of wire glass to stop flying particles of metal and abrasive

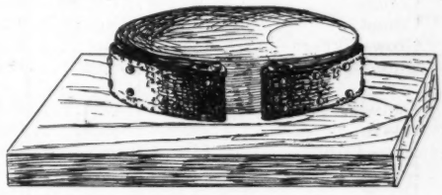
Brake Rivet Anvil

An old flywheel makes the very best kind of an anvil for riveting brake lining to external bands. The flywheel size should be selected so that its diameter is slightly less than the diameter of the brake band. The rivets should be inserted so that they will spread longitudinally, the curvature of the wheel aiding in this.

The mounting of the flywheel is a simple matter. A portion of the crankshaft and the main bearing cap make it very easy to attach the flywheel to the bench. The crankshaft is sawed in two just forward of the rear main bearing journal, and a main bearing journal box complete is used for clamping the crankshaft and flywheel to the bench.



Brake rivet anvil made from an old flywheel



Jig to assist the removal of worn brake lining

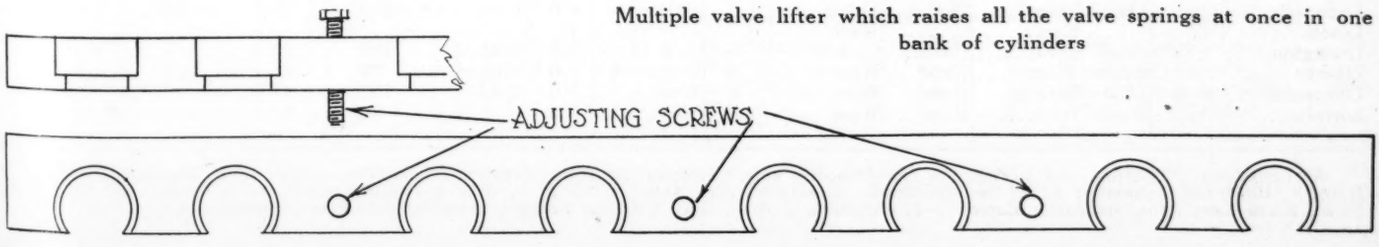
Brake Lining Removal Jig

Brake relining is a slow job in most shops. So slow that many complain that there is no money in it. And no wonder, for on the whole the same primitive methods that have always been used still hold, the only advance in years is the quite general adoption of the split rivet. That in itself was quite a time saver, but there is still much to be done.

In the first place much time may be wasted in cutting the rivets to allow the removal of the old lining. In doing this work the band is found rather awkward to handle. To facilitate this operation a wooden jig will be found profitable where many bands of the same size are done, and this applies particularly to Ford transmission bands. The band is slipped over the circular portion of the jig and the yoke ends slide over the two dowel pins. Thus the band is held securely while the rivets are chipped off. Andy Kulick, Detroit Motor Sales Co., Detroit.

Multiple Valve Lifter

The illustration shows a simple valve lifter which raises all the valve springs on one bank of cylinders at once. A bar of steel about 1 by 2 in. is drilled and countersunk so that it will receive all eight valve spring seats. Then the tool is put in place and when the three adjusting screws are turned all eight valve springs are compressed. This is used by the Cadillac service station in Detroit.



Multiple valve lifter which raises all the valve springs at once in one bank of cylinders

Specifications of the Electrical Equipment Found on 1920 Passenger Cars

Make and Model	IGNITION			GENERATOR		MOTOR		BATTERY			Wiring System	Units Combined	FUSES		
	System	Make	Control	Make	Voltage	Make	Voltage	Make	Amp. Hr.	Voltage			Type	Volts	Amp.
Allen 43	Single	Conn	Hand	A-L	6	A-L	6	Prest-O-L	80	6	1	GI	GT	6	15
American B	Single	Conn	Hand	West	6	Remy	6	Willard	90	6	1	S	3-A	1.250	20
Anderson All	Single	Remy	Hand	Remy	6	West	6	Willard	90	6	1	S	SAE	6	5
Apperson All	Single	Remy	Hand	Bijur	6	Bijur	6–8	Willard	108	6	1	S	Open	1.250	10
Argonne 4		Eisemann	Hand	West	12	West	12	Exide	100	12	1			12	20
Auburn 6–39	Single	Remy	Hand	Remy	6	Remy	6	Willard	80	6	1	S		6–8	25
Beggs 19-T & 19-R		Conn	Hand	A-L	6	A-L	6	Exide	80	6	1	GT	Cart	6	15
Biddle B-1 & B-5	Single	Simms	Hand	G & D	6	G & D	6	Willard	90	6	1	S	GT	6	10
Bour-Davis 20	Single	Remy	Hand	Remy	6	Remy	6	Willard	103	6	1	S	GT	6	15
Brewster	Single	Berling	Hand	U. S. L.	12	U. S. L.	12				1				
Briscoe 4–34	Single	Conn	Hand	A-L	6	A-L	6	Prest-O-L	80	6	1	GI	GT	6	20
Buick	Single	Delco	Hand	Delco	6	Delco	6	Willard	80	6	1	S			
Cadillac 57	Single	Delco	H. & A.	Delco	6	Delco	6	Exide	130	6	1	GM			
Case V-20	Single	West	H. & A.	West	6	West	6	Willard	117½	6	1	GI	5AGT	50	105
Chalmers 25-C	Single	Remy	Hand	A-L	6	A-L	6	Prest-O-L	106	6	1	GI		6	151
Champion KO	Single	Delco	Hand	Dyneto	6	Dyneto	6	Willard	90	6	1	S	GT	6	200
Chandler All	Single	Bosch	Hand	G & D	6	G & D	6	Prest-O-L	105	6	1	S	GT	6	
Chevrolet All	Single	Remy	Hand	A-L	6	A-L	6	Willard	80	6	1	GI	GT	6	
Cleveland 40	Single	G & D	Hand	G & D	6	G & D	6	Prest-O-L	94	6	1	S	GT	6	
Cole All	Single	Delco	H & A	Delco	6	Delco	6	Prest-O-L	50	6	1	S			
Columbia All	Single	At-Kent	Hand	A-L	6	A-L	6	Prest-O-L	80	6	1	S			
Comet C-53	Single	Wagner	Hand	Wagner	6	Wagner	6	Willard	75	6	1				
Crow-Elkhart L-55	Single	Conn	Hand	Dyneto	6	Dyneto	6	Exide	120	6	1		Cart	6	10
Cunningham V-3	Single	Delco	H & A	West	6	West	6	Willard	120	6	1				
Daniels 8-D	Single	Delco	H & A	Delco	6	Delco	6	Willard	140	6	1	S			
Davis 51	Single	Bosch	Hand	Delco	6	Delco	6	Willard	80	6	1	S			
Dixie Flyer	Single	Conn	Hand	Dyneto	6	Dyneto	6	Willard	6–80		2				
Dodge Brothers	Single	Own	H & A	N. E.	12	North East	12	Willard	50	12	1	GM	Encl	1–50	10
Dorris 6–80	Single	Bosch	Hand	West	6	West	6	Willard	115	6	1	S	GT	5–8	15
Dort 15	Single	Conn	Hand	West	6	West	6	U. S. L.	85	6	1	S		6	10
du Pont A	Single		H & A	West	6	West	6	Exide	115	6	1				
Economy 6–46	Single	Own	Hand	A-L	6	A-L	6	Willard	90	6					
Elcar All	Single	Delco	Hand	Delco	6	Delco	6	Willard	90	6	1	S	GT	6–8	20
Elgin K	Single	Wagner	Hand	Wagner	6	Wagner	6	Willard	90	6	1		GT	6–8	20
Essex A	Single	Delco	H & A	Delco	7	Delco	6	Exide	105	6	1	S			
Ferris				L-N		L-N									
Ford T*	Single	Own	Hand	Own	6	Own		Opt	80	6	1	S			
Franklin 9-B	Single	At-Kent	Auto	Dyneto	12	Dyneto		Willard	60	12	2	GM	GT	14	10
Gardner O	Single	West	Hand	West	6	West	6	Willard	90	6	1	S	GT	6	20
Geronimo		Delco		Dyneto	6	Dyneto	6	Willard	88	6	1	S			
Grant H	Single	At-Kent	Hand	Bijur	6	Grant-W	6	Prest-O-L	105	6	1	S	2GT	6–8	15
Hanson 45-A	Single	Remy	Hand	A-L	6	A-L	6	Prest-O-L	80	6	1		Cart	6	3
Harroun	Single	Remy	Hand	Remy	6	Remy	6	Prest-O-L	80	6	1				
Harvard 4–20		At-Kent		Wagner	6	Wagner	6	Nat. Carb			1	S			
Hatfield A		Conn		Dyneto	6	Dyneto	6	Willard	100	6	1	GI			
Haynes All	Single	Opt	Hand	Leece-N	6	Leece-N	6	Willard	120	6	2	GI	GT	6	5
H. C. S. Special		Delco		Delco		Delco									
Hollier 206-B	Single	R & B	Hand	West	12	West	6	U. S. L.	80	6	1	S	GT	6	20
Holmes	Single	Eisemann	Auto	Dyneto	12			Willard	100	12	2	S	GT	15	15
Hudson Super-Six	Single	Delco	H & A	Delco	7	Delco	7	Exide	105	6	1	GM			
Huffman	Single	Conn	Hand	Dyneto	6	Dyneto	6	Willard	80	6	1	S		6	25
Hupmobile R	Single	At-Kent	Hand	West	6	West	6	Willard	87½	6	1	S	Encl	6	10
Jackson 6–38	Single	Remy	Hand	A-L	6	A-L	6	U. S. L.	94	6	1	GI	GT	6–8	15
Jones All	Single	Remy	Hand	A-L	6	A-L	6	Prest-O-L	120	6	1	GI	GT	6	20
Jordan F	Single	Delco	Hand	Delco	6	Delco	6	Willard	108	6	1	S	C. B.		
Jordan M	Single	Delco	Hand	Delco	6	Delco	6	Willard	94	6	1	S	C. B.		
King 8	Single	At-Kent	Hand	West	6	West	6	Prest-O-L	120	6	1	S	Cart	6	10
Kissel	Single	Remy	Hand	Remy	6	Remy	6	Willard	117.5	6	1	S	3 A. G.	6	20
Kline 6–55-J	Single	Conn	Hand	Wagner	6	Wagner	6	Prest-O-L	80	6	1	S	5 A. G.	6	
LaFayette	Double	Delco	H & A	Delco	6	Delco	6	Exide	120	6		GM		6	
Leach		Remy		West											
Lexington S-20	Single	Conn	Hand	G. & D.	6	G. & D.	6	Willard	100	6	1		GT	6	15-5
Liberty 10-C	Single	Wagner	Hand	Wagner	6	Wagner	6	Willard	90	6	1	GI			
Locomobile 48–6–7	Dual	Berling	Hand	West	6	West	6	Exide	150	6	1	S	G. T.	6	10
Lorraine *	Single	West	Hand	West	6	West	6	U. S. L.	94	6	1	S	GT		

ABBREVIATIONS: *Starting and Lighting in closed models only. Ignition: *At-K*, Atwater-Kent; *Conn.*, Connecticut; *West*, Westinghouse; *Auto*, Automatic; *H. & A*, Hand and Automatic; *S. A.*, Semi-Automatic. Generator: A-L, Auto-Lite; *G & D*, Gray & Davis; *Leece-N*, Leece-Neville; *Ward-L.*, Ward-Leonard; *N. E.*, North East; *Split*, Splitdorf. Motor: *A-L*, Auto-Lite, *G & D*, Gray & Davis; *Leece-N*, Leece-Neville; *West*, Westinghouse.

Giving Ignition, Starting, Lighting, Battery, Lamp, Spark Plug and Horn Data

LAMP CANDLEPOWER, VOLTAGE AND TYPE OF BASE									SPARK PLUGS			Horn	Make and Model
	HEADLIGHTS		SIDELIGHTS		TAILLIGHTS		DASHLIGHT						
Base Contact	Volts	CP.	Volts	CP.	Volts	CP.	Volts	CP.	Make	Diam. Inches	Thread Pitch		
Single	6-8	18	*6-8	5	6-8	2	6-8	2	Champion	7/8	18	Klaxon	Allen 43
Single	6-8	15	*6-8	5	3-4	2	3-4	2	Bethlehem	7/8	18	Sparton	American B
Single	6-8	21	6-8	4	6-8	4	6-8	4	A. C.	7/8	18	Klaxon	Anderson All
Double	6-8	18	*6-8	4	d6-8	2	d6-8	2	A. C.	7/8	18	Sparton	Apperson All
Single	12	21	12	6	12	2	12	2	A. C.	7/8	18	Klaxon	Argonne 4
Single	6-8	15	*6-8	4	6-8	2	6-8	2	Rajah	7/8	18	E. A.	Auburn 6-39
Single	6-8	21	6-8	4	3-4	2	3-4	2	Champion	7/8	18	Trojan	Beggs 19-T & 19R
Single	6-8	21	*6-8	4	6-8	2	d6-8	2	Splitdorf	7/8	18	Klaxon	Biddle B-1 & B-5
Single	6-8	15	6-8	5	6-8	2	6-8	2	A. C.	7/8	18	E. A.	Bour-Davis 20
Single	12	36	12	4	6-8	2	d6-8	2	Herz-Boug	7/8	18	Klaxon	Brewster
Single	6-8	21			6-8	2	d6-8	2	Champion	7/8	18	Sparton	Briscoe 4-34
Single	6-8	15	6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Stewart	Buick
Single	7	18	8	6	4	2	3-4	2	Titan	7/8	18	Delco	Cadillac 59
Single	6-8	21	6-8	4	6-8	2	6-8	2	A. C.	7/8		Klaxon	Case V-20
Single	6-8	15	*6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Schwarze	Chalmers 35-C
Single	6-8	15			6-8	2	6-8	2	Champion	7/8	18	Garford	Champion KO
Single	6-8	15	6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Klaxon	Chandler All
Single	6-8	21	6-8	4	6-8	2	d6-8	4	A. C.	7/8	18	Klaxon	Chevrolet All
Single	6-8	17	6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Trojan	Cleveland 40
Single	6-8	21	*6-8	5	6-8	4	d6-8	5	A. C.	7/8	18	Sparton	Cole All
Single	6-8	15	*6-8	4	6-8	2	d6-8	2	Champion	7/8	18	Schwarze	Columbia All
Single	6-8	18			6-8	2	6-8	4	Champion	7/8	18	Klaxon	Comet C-53
Single	6-8	15	6-8	4	6-8	2	6-8	2	Champion	7/8	18	E. A. Lab.	Crow-Elkhart L-55
Single	6-8	21	6-8	4	6-8	2	6-8	2	Champion	7/8	18	Sparton	Cunningham V-3
Single	6-8	21	6-8	4	6-8	2	d6-8	2	A. C.	7/8	18	Klaxon	Daniels 8-D
Single	6-8	21			6-8	2	6-8	2	A. C.	7/8	18	Klaxon	Davis 51
Double	6-8	15			d3-4	2	d3-4	2	Champion	7/8	18	Garford	Dixie Flyer
Single	12-16	15			12-16	2	12-16	2	A. C.	7/8	18	Klaxon	Dodge Brothers
Single	6-8	21	6-8	4	6-8	2	6-8	2	Opt.	7/8	18	Klaxon	Dorris
Single	6-8	15			6-8	2	d6-8	2	A. C.	7/8	18	Schwarze	Dort 15
Single	6-8	21	6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Klaxon	du Pont A
Single													Economy 6-46
Single	6-8	21	6-8	4	6-8	2	6-8	2	Champion	7/8	18	E. A. L.	Elcar All
Single	6-8	17			6-8	2	6-8	2	Champion	7/8	18	E. A. L.	Elgin K
Single	6-8	15			3-4	2	*3-4	2	A. C.	18 m.m.	1.5 m.m.	Sparton	Essex A
													Ferris
Double	6-8	17	6-8	2	6-8	2			Champion	1/2	pipe	Own	Ford T
Double	12-16	21	*12-16	4	6-8	2	6-8	2	Opt.	7/8	18	Klaxon	Franklin 9-B
Single	6-8	15			6-8	2	6-8	2	Champion	7/8	18	Trojan	Gardner G
Single	6-8	21			6-8	2	6-8	2	Champion	7/8	18	Trojan	Geronimo
Single	6-8	15	6-8	4	6-8	2	6-8	2	Champion	7/8	18	Trojan	Grant H
Single	6-8	15			6-8	2	6-8	2	Champion	7/8	18	Schwarze	Hanson 45-A
Single	6-8	15			3-4	2	d3-4	2	A. C.			Schwarze	Harroun
	6-8		3-4		3-4		*3-4			7/8	18		Harvard 4-20
Single	6-8	15	*4-8	4	6-8	4	6-8	2	A. C.	7/8	18	Ecco	Hatfield A
Double	6-8	15	*6-8	12	d6-8	2	6-8	2	A. C.	7/8	18	Klaxon	Haynes All
													H. C. S. Special
Single	6-8	15	6	4	3-4	2	3-4	2	A. C.	7/8	18	Sparton	Hollier 206-B
Double	12-16	30			6-8	2	6-8	2	Bethlehem	7/8	18	Klaxon	Holmes
Single	6-8	15	6-8	4	3-4	2	*3-4	2	A. C.	7/8	18	Sparton	Hudson Super Six
													Huffman
Single	6-8	15	6-8	2	6-8	2	6-8	2	A. C.	7/8	18	Trojan	Hupmobile R
Single	6-8	15	6-8	4	3-4	2	3-4	2	Champion	7/8	18	Stewart	Jackson 6-38
Double	6-8	15	*6-8	4	s6-8	2	s6-8	2	Champion	7/8	18	Newtone	Jones
Single	6-8	18	*6-8	4	6-8	3	6-8	3	A. C.	7/8	18	Sparton	Jordan F
Single	6-8	18	6-8	4	6-8	3	6-8	3	A. C.	7/8	18	Sparton	Jordan M
Single	6-8	15	*6-8	4	6-8	2	6-8	2	Champion	7/8	18	Sparton	King 8
Double	6-8	18			d6-8	2	d6-8	2	A. C.	7/8	18	Sparton	Kissel
Single	6-8	15			6-8	2	d6-8	2	Champion	7/8	18	Klaxon	Kline 6-55-J
	6-8	21	6-8	6	3-4	4	3-4	2		7/8	18	Klaxon	Lafayette
													Leach
Single	6-8	21	6-8	4	6-8	2	d6-8	4	Bethlehem	7/8	18	E. A. L.	Lexington S-20
Single	6-8	15	*6-8	4	6-8	2	d6-8	2	A. C.	7/8	18	United	Liberty 10-C
Single	6-8	21	6-8	6	6-8	4	6-8	2	Titan	7/8	18	Klaxon	Locomobile 48-6-7
Single	6-8	17			6-8	2	6-8	2	A. C.	7/8	18	Schwarze	Lorraine

Battery: *Prest-O-L*, **Prest-O-Lite.** **Wiring system:** *GI*, **Generator and Ignition** combined; *GIM*, Generator, Ignition, Motor combined; *S*, Generator, Motor Ignition separate; *GM*, Generator and Motor combined. Fuses: *GT*, Glass Tube: *Cart*, Cartridge; *C. B.*, Circuit Breaker. Lamps: *Dashlights in series with taillights; headlight contains sidelight; d,—double contact; s,—single contact.

Specifications of the Electrical Equipment Found on 1920 Passenger Cars

Make and Model	IGNITION			GENERATOR		MOTOR	BATTERY				Wiring System	Units Combined	FUSES		
	System	Make	Control	Make	Voltage	Make	Voltage	Make	Amp. Hr.	Voltage			Type	Volts	Amp.
Maibohm.....B	Single	At-Kent...	Hand...	Bijur.....	6	Bijur.....	6	Willard....	94	6	1	S.....	2-A.....	6	20
Marmon.....34	Single	Delco.....	Auto....	Delco.....	6	Delco.....	6	Willard....	162	6	1	GI....	Cart.....	.....	.....
Maxwell.....25	Single	At-Kent...	Hand...	Simms-Huff	12	Simms-Huff	12	Prest-O-L..	35	12	1	GM...	Cart....	12	20
McFarlan..... 127	Double	Opt.....	Hand...	West.....	6	West.....	6	Willard....	.....	6	1	GI....	5 A. G..	6	.....
Mercer.....Ser. 5	Single	Berling....	Hand...	West.....	6	West.....	6	Willard....	90	6	1	S.....	Cart.....	.....	10
Meteor.....KR	Single	Simms....	Hand...	Bijur.....	6	Bijur.....	6	Willard....	.....	6	.....	.....	.....	.....	.....
Metz, Master Six.....	Single	Conn.....	Hand...	West.....	6	West.....	6	Willard....	120	6	1	.....	.....	.....	.....
Mitchell.....F-40	Single	Remy.....	Hand...	Remy.....	6	Remy.....	6	Willard....	100	6	1	S.....	GT.....	6	10
Monitor.....	Single	Conn.....	Hand...	Dyneto....	6	Dyneto....	.....	Prest-O-L..	110	6	1	.....	.....	.....	.....
Monroe.....S-9	Single	Conn.....	Hand...	A-L.....	6	A-L.....	6	U. S. L....	80	6	1	.....	.....	.....	.....
Moon.....6-48	Single	Wagner....	Auto....	Delco.....	6	Delco.....	6	Exide.....	120	6	1	S.....	.....	.....	.....
Moon.....6-68	Single	Delco.....	Auto....	Delco.....	6	Delco.....	6	Exide.....	120	6	1	S.....	.....	.....	.....
Moore.....*.....F	Single	Conn.....	Hand...	A-L.....	6	A-L.....	6	Willard....	80	6	2	.....	.....	.....	.....
Nash.....	Single	Wagner...	H & A..	Delco.....	6	Wagner...	6	Willard....	100	6	1	S.....	.....	.....	.....
National....Series BB	Single	Delco.....	H & A..	West.....	6	West.....	6	Prest-O-L..	110	6	1	S.....	GT.....	6-8	5
Nelson.....D	Single	Bosch.....	Hand...	U. S. L....	12	U. S. L....	12	Willard....	72	12	2	S.....	G.....	12	5-30
Noma.....1-B	Single	Delco.....	Hand...	Delco.....	6	Delco.....	6	Willard....	104	6	.....	.....	.....	.....	.....
Oakland.....34-B	Single	Remy.....	Hand...	Remy.....	6-8	Remy.....	6	Prest-O-L..	85	6-8	1	GI....	.....	.....	.....
Ogren.....6-60	Single	Bosch.....	Hand...	West.....	6	West.....	6	Willard....	120	6	1	.....	Cart.....	6	10
Oldsmobile.....37-A	Single	Remy.....	Hand...	Remy.....	6	Willard....	6	Remy.....	80	6	1	.....	.....	.....	.....
Oldsmobile.....45-B	Single	Delco.....	Hand...	Delco.....	6	Delco.....	6	Willard....	80	6	1	.....	.....	.....	.....
Olympian.....45	Single	Conn.....	Hand...	A-L.....	6	A-L.....	6	U. S. L....	.....	6	.....	.....	.....	.....	.....
Overland.....4	Single	Conn.....	Hand...	A-L.....	6-8	A-L.....	6	U. S. L....	80	6-8	1	GI....	Glass....	6	20
Packard.....3-35	Single	Delco.....	H & A..	Bijur.....	6	Bijur.....	6	Willard....	120	6	1	S.....	GT.....	6	10
Paige.....All	Single	At-Kent...	H & A..	G & D....	6	G & D....	6	Willard....	108.4	6	1	S.....	G.....	.....	20
Pan-American.....All	Single	At-Kent...	Hand...	West.....	6	West.....	6	Willard....	100	6	1	S.....	G.....	6	.....
Paterson.....6-47	Dual	Delco.....	Hand...	Delco.....	6	Delco.....	6	Willard....	110	6	1	.....	.....	.....	.....
Peerless.....Ser. 6	Single	At-Kent...	H & A..	A-L.....	6	A-L.....	6	Willard....	.....	6	1	.....	.....	.....	30
Piedmont.....4-30	Single	Delco.....	Hand...	Dyneto....	6	Dyneto....	6	Willard....	90	6	1	S.....	.....	.....	.....
Piedmont.....6-40	Single	Remy.....	Hand...	Remy.....	6	Remy.....	6	Willard....	90	6	1	S.....	.....	.....	.....
Pierce-Arrow..38&48	Double	Delco.....	H & A..	West.....	6-8	West.....	6	Willard....	150	6	1	S.....	5 A. G..	6-8	.....
Pilot.....6-45	Dual	Delco.....	Hand...	Delco.....	6	Delco.....	6	Prest-O-L..	80	6	1	GI....	.....	.....	.....
Porter.....46	Dual	Berling....	Hand...	West.....	12	West.....	12	Prest-O-L..	118	12	1	S.....	Cart.....	12	15
Premier.....6-D	Single	Delco.....	Hand...	Delco.....	6	Delco.....	6	Willard....	123.5	6	1	S.....	.....	.....	.....
Reo.....T & U	Single	North East	Hand...	North East	6	North East	6	Willard....	108.5	6	2	GI....	Wire.....	6	5
Leo.....T 6& U6	Single	North East	Hand...	North East	6	North East	6	Willard....	108.5	6	1	S.....	Wire.....	6	6
Revere.....	Single	Bosch.....	Hand...	West.....	6	West.....	6	Willard....	120	6	1	S.....	GT.....	6	15
Roamer.....6-54	Single	Bosch.....	Hand...	Bijur.....	6	Bijur.....	6	Columbia..	117	6	1	S.....	3A.....	6	10
R & V Knight...J & R	Dual	Wagner...	Hand...	Wagner...	6	Wagner...	6	Willard....	117	6	1	S.....	Cart.....	250	20
Saxon.....125	Single	Remy.....	Hand...	Wagner...	6	Wagner...	6	Prest-O-L..	80	6	1	S.....	Cart.....	6-8	15
Sayers.....C.P.	Single	Delco.....	Hand...	Delco.....	6	Delco.....	6	Willard....	80	6	1	GI....	C.B.....	.....	.....
Scripps-Booth.....B	Single	Remy.....	Hand...	Remy.....	6	Remy.....	6	Prest-O-L..	85	6	1	GI....	GT.....	6	20
Seneca.....H-2	Single	Conn.....	Hand...	Allis Chal..	6	Allis Chalm	.....	Prest-O-L..	88	6	1	GM...	.....	.....	20
Singer.....20	Single	Bosch.....	Hand...	West.....	6	West.....	6	Willard....	115	6	1	S.....	G. C.....	.....	5& 10
Skelton.....35	.....	Conn.....	Hand...	West.....	6	West.....	6	Prest-O-L..	85	6	1	.....	.....	.....	.....
Spacke.....S-20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Standard.....8-I	Double	Dixie.....	Hand...	West.....	6	West.....	6	Willard....	160	6	1	S.W...	2-A.....	6	15
Stanley.....735	.....	.....	.....	Remy.....	6	.....	.....	Willard....	100	6	1	G.....	Cart.....	6	20
Stearns.....SKL-4	Single	At-Kent...	Hand...	West.....	12	West.....	12	Willard....	61.5	12	1	S.....	.....	.....	20
Stephens.....80	Single	Conn.....	Hand...	A-L.....	6	A-L.....	6	U. S. L....	116	6	1	S.....	Cart.....	6	20
Stevens-Duryea.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Studebaker.....All	Single	Wagner...	Hand...	Wagner...	6-8	Wagner...	6	Willard....	115	6-8	1	S.....	Cart.....	6	10
Stutz.....H	Double	.....	Hand...	Remy.....	6	Remy.....	6	Willard....	.....	12	1	.....	.....	.....	.....
Templar.....445	Single	Simms....	Hand...	Bijur.....	6	Bijur.....	6	Columbia..	100	6	1	S.....	.....	6	20
Tulsa.....E-1,2,3	Single	Delco.....	Hand...	Dyneto....	6	Dyneto....	6	Exide.....	90	6	1	S.....	GT.....	6	15
Velie.....48	Single	At-Kent...	S. A....	Bijur.....	6	Bijur.....	6	Willard....	120	6	1	S.....	Wire.....	.....	15
Westcott...C-38&C-48	Single	Delco.....	H & A..	Delco.....	6	Delco.....	6	Willard....	120	6	1	S.....	CB.....	.....	.....
Willys-Knight.....20	Single	Conn.....	Hand...	A-L.....	6-8	A-L.....	6	U. S. L....	170	6	1	GI....	GT.....	6	20
Winton Six.....24	Single	Bosch.....	Hand...	Bijur.....	6	Bijur.....	6	Willard....	120	6	.....	S.....	GT.....	6	15
Winton Six.....25	Single	Bosch.....	Hand...	Bijur.....	6	Bijur.....	6	Willard....	139	6	1	S.....	CB.....	6	15
Winther.....61	Single	West.....	Hand...	West.....	6	West.....	6	Willard....	127	6	.....	S.....	GI.....	6	10
Wolverine.....	Single	Bosch.....	Hand...	Bijur.....	.....	Bijur.....	6	Prest-O-L..	120	6	1	S.....	CB.....	6	15

ABBREVIATIONS: *Starting and Lighting in closed models only. Ignition: *At-K*, Atwater-Kent; *Conn.*, Connecticut; *West*, Westinghouse; *Auto*, Automatic; *H. & A*, Hand and Automatic; *S. A.*, Semi-Automatic. Generator: A-L, Auto-Lite; *G & D*, Gray & Davis; *Leece-N*, Leece-Neville; *Ward-L.*, Ward-Leonard; *N. E.*, North East; *Split*, Splitdorf. Motor: *A-L*, Auto-Lite, *G & D*, Gray & Davis; *Leece-N*, Leece-Neville; *West*, Westinghouse.

Giving Ignition, Starting, Lighting, Battery, Lamp, Spark Plug and Horn Data

LAMP CANDLEPOWER, VOLTAGE AND TYPE OF BASE									SPARK PLUGS			Horn	Make and Model
Base Contact	HEADLIGHTS Volts	HEADLIGHTS CP.	SIDELIGHTS Volts	SIDELIGHTS CP.	TAILLIGHTS Volts	TAILLIGHTS CP.	DASHLIGHT Volts	DASHLIGHT C P.	Make	Diam. Inches	Thread Pitch		
Single	6-8	20	6-8	4	6-8	2	6-8	2	Champion	7/8	18	Schwarze	Maibohm B
Single	6-8	30	*6-8	9	6-8	2	6-8	2	A. C.	7/8	18	Sparton	Marmon 34
Double	12-16	15	*12-16	4	12-16	2	12-16	2	Champion	7/8	18	Schwarze	Maxwell 25
Single	6-8	21	*6-8	12	6-8	2	d6-8	2	A. C.	7/8	18	Klaxon	McFarlan 127
Single	6-8	21	6-8	5	6-8	5	6-8	4	Champion	7/8	18	Sparton	Mercer Ser. 5
Single	6-8		6-8		6-8		6-8						Meteor K R
Single	6-8	16	6-8	4	6-8	2	6-8	2	Champion	7/8	18	Trojan	Metz, Master Six
Single	6-8	15			s6-8	2	6-8	2	A. C.	7/8	18	Sparton	Mitchell F-40
									Champion	7/8	18	Klaxon	Monitor
Double	6-8	16			6-8	2	6-8	2	Champion	7/8	18	Trojan	Monroe S-9
Single	6-8	20			6-8	2	d6-8	2	Champion	7/8	18	Klaxon	Moon 6-48
	6-8	20			6-8	2	d6-8	2	Champion	7/8	18	Klaxon	Moon 6-68
Single	6-8	20	6-8		6-8	2			Champion	7/8	18	Garford	Moore F
Single	6-8	15	*6-8	4	6-8	2	d6-8	2	A. C.	7/8	18	Trojan	Nash
	6-8	20	*6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Sparton	National Series BB
Double	12-16	15	12-16	4	12-16	2	12-16	2	Champion	7/8	18	Schwarze	Nelson D
Single	6-8				6-8		d6-8						Noma 1-B
Single	6-8	15			6-8	2	6-8	2	A. C.	7/8	18	Schwarze	Oakland 34-B
Single	6	32	6		6	4	6	4	Champion	7/8	18	Klaxon	Ogren 6-60
Single	6-8	15	6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Klaxon	Oldsmobile 37-A
Single	6-8	15	*6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Klaxon	Oldsmobile 45-B
									Champion			E. A. Lab.	Olympian 45
Single	6-8	16			3-4	2	*3-4	2	Champion	1/2		A. L.	Overland 4
Single	6-8	33	*6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Sparton	Packard 3-35
Single	6-8	17	6-8	4	6-8	2	d6-8	2	A. C.	7/8	18	Trojan	Paige All
Single	6-8	32			6-8	2	*3-4	4	Champion	7/8	18	E. A. Lab.	Pan-American All
Single	6-8	15	6-8	4	6-8	2	6-8	2	A. C.			E. A. Lab.	Paterson 6-47
Single	6-8	15	6-8		6-8	2	6-8	4	A. C.			Sparton	Peerless Ser. 6
Single	6-8	12			6	2	6	2	Champion	7/8	18	Klaxon	Piedmont 4-30
Single	6-8	12			6	2	6	2	Champion	7/8	18	Klaxon	Piedmont 6-40
Single	6-8	20			6-8	5	6-8	5	A. C.	7/8	18	Klaxon	Pierce-Arrow 38&48
Single	6-8	15			6-8	2	6-8	2	A. C.	7/8	18	Schwarze	Pilot 6-45
Single	12-16	20	12-16	4	12-16	4	12-16	2	Champion		18	Stewart	Porter 46
Double	6-8	21	*6-8	4	6-8	2	d6-8	2	A. C.	7/8	18	Klaxon	Premier 6
Double	6-8	15			3-4	2	*3-4	2	A. C.	7/8	18	Trojan	Reo T & U
Single	6-8	15			6	2	*3-4	2	A. C.	1/2		Klaxon	Reo T6 & U6
Single	6-8	20	*6-8	8	6-8	4	6-8	4	Rajah	7/8	18	Klaxon	Revere
Single	6-8	15	*6-8	2	6-8	2	d6-8	2	A. C.	7/8	18	Sparton	Roamer 6-54
Single	6-8	15	6-8	4	6-8	2	d6-8	4	A. C.	7/8	18	Klaxon	R & V Knight J. & R.
Single	6-8	15			6-8	2	6-8	2	A. C.	7/8	18	Trojan	Saxon 125
Single	6-8	15			6-8	2	d6-8	2	Champion	7/8	18	Stewart	Sayers C. P.
Single	6-8	18			6-8	2	6-8	2	A. C.	7/8	18	Opt	Scripps-Booth B
Single	6-8	15	6-8	2	6-8	2	d6-8	2	A. C.	7/8	18	Fitzgerald	Seneca H-2
Single	6-8	15		4	6-8	2	d6-8	2	A. C.	7/8	18	Klaxon	Singer 20
	6	18			6	2	6	2	Bethlehem	7/8	18	E. A. Lab.	Skelton 35
													Spacke S-20
Double	6-8	21	6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Klaxon	Standard 8-I
Double	6-8	21	6-8	4	6-8	2	6-8	2				Klaxon	Stanley 735
Single	12-16	21	*12-16	4	12-16	2	12-16	2	A. C.	7/8	18	B.&A.Lab.	Stearns SKL-4
Single	6-8	15	6-8	2	6-8	2	6-8	2	Champion	7/8	18	Trojan	Stephens 80
													Stevens-Duryea
Single	6-8	12			6-8	2	6-8	2	Champion	1/2		Sparton	Studebaker All
Double	6-8	15	*6-8	4	6-8	2	6-8	2	A. C.			Klaxon	Stutz H
Single	6-8	21	*6-8	4	6-8	2	6-8	2	Champion	7/8		Klaxon	Templar 445
Single	6-8	21	6-8	2	6-8	2	d6-8	2	Champion	7/8	18	Trojan	Tulsa E-1,2,3
Single	6-8	15	6-8	4	6-8	4	d6-8	4	Champion	7/8	18	Sparton	Velie 48
Single	6-8	18	*6-8	4	3-4	2	d3-4	2	A. C.	7/8	18	Klaxon	Westcott C-38&C-48
Single	6-8	30			3-4	2	*3-4	2	Champion			Sparton	Willys-Knight 20
Single	6-8	17	6-8	7	6-8	2	6-8	2	Champion	7/8	18	American	Winton Six 24
Single	6-8	17	6-8	7	6-8	2	6-8	2	Champion	7/8	18	Electric	Winton Six 25
Single	6	18			6	4	6	2	A. C.	7/8	18	Klaxon	Winther 61
Single	6-8	32	6-8	7	6-8	2	6-8	2	A. C.	7/8	18	Klaxon	Wolverine

Battery: *Prest-O-L*, Prest-O-Lite. Wiring system: *GI*, Generator and Ignition combined; *GIM*, Generator, Ignition, Motor combined; *S*, Generator, Motor Ignition separate; *GM*, Generator and Motor combined. Fuses: *GT*, Glass Tube: *Cart*, Cartridge; *C. B.*, Circuit Breaker. Lamps: *Dashlights in series with taillights; headlight contains sidelight; d,—double contact; s,—single contact.

From the Four Winds

Glimpses at the World of Motordom

Coming Motor Events

AUTOMOBILE SHOWS

Duluth Minn	Automobile Show	March 22 to 27
Oklahoma City, Okla	Oklahoma City Dealers' Ass'n	March 22 to 27
Torrington, Conn.	Automobile Show	March 22 to 27
Utica, N. Y.	Automobile Show	March 22 to 27
Columbia, S. C.	Automobile Show	March 22 to 27
Newton, Kans.	Automobile Show	March 24 to 27
Hutchinson, Kans.	Automobile Show	March 25 to 27
Goldsboro, N. C.	Goldsboro Automotive Trade Ass'n	March 31 to Apr. 3
Gloversville, N. Y.	Automobile Show	April 5 to 10
Albany, Ala.	Automobile Show	April 6 to 10
Macon, Ga.	Macon Automobile Dealers' Ass'n	May 6 to 8

RACES

Indianapolis Speedway	500-Mile Race	May 31
Uniontown, Pa.	Speedway Race	June 12
Tacoma, Wash.	Speedway Race	July 5
Cincinnati, O.	Speedway Race	Sept. 6
Uniontown, Pa.	Speedway Race	Sept. 6

TOURS

Omaha, Neb.	Truck Reliability Run	June 1
Lake Huron Tour		July 4
New York-San Francisco	Glidden Tour	September

California Has One Car Per 5.6 Persons—Almost coincident with the announcement that California has nearly $70,000,000 available for paved highway construction in 1920 is the official tabulation of motor vehicles for the United States, showing that the Golden State leads all others in automobiles in proportion to population. California, with 493,463 motor vehicles has one to each 5.6 persons in the state.

This distinction formerly was held by Iowa, with Nebraska second. Last year, however, California gained 141,600 over the previous year in registrations, a percentage of 40.2. This brought California from seventh place to first, leaving Iowa in second place.

This situation is claimed by good roads boosters to prove their contention that the highway is parent of the automobile. Automobile enthusiasts have contended that the rapid increase in the use of automobiles forced the building of good highways, but the history of highways and autos in California as evidenced by official figures indicates that automobiles follow good roads rather than the reverse.

Removing Car After Plunging Over Embankment

In removing this automobile, heavy planks were placed on each side of the car to which were wired chain hoist, which were fastened to the front axle of the car. At the top of the wall a motor truck was backed up near the ditch car and a heavy rope was made fast to the rear axle, as shown in the illustration. At the hoists were operated thus raising the car, the motor car kept the rope attached to the rear axle tight to guard against the ditched car turning over, as it was standing nearly straight up and down